WATER GLOBAL PRACTICE

Joining Forces for Better Services?

When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together

AUGUST 2017

WORLD BANK GROUP

About the Water Global Practice

Launched in 2014, the Word Bank Group's Water Global Practice brings together financing, knowledge, and implementation in one platform. By combining the Bank's global knowledge with country investments, this model generates more firepower for transformational solutions to help countries grow sustainably.

Please visit us at www.worldbank.org/water or follow us on Twitter at @WorldBankWater.

Joining Forces for Better Services?

When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together

AUGUST 2017

WORLD BANK GROUP

Please cite the work as follows: World Bank. 2017. *Joining Forces for Better Services?: When, Why, and How Water and Sanitation Utilities Can Benefit from Working Together*. Washington, DC, World Bank.

Cover photo: Aerial View of Water Supply and Sanitation Infrastructure in Portugal. (c) Jorge Medeiros / Videocontacto, Tecnologias de Inf., Lda. / World Bank.
Cover design: Jean Franz, Franz & Company, Inc.

Contents

Boxes

Figures

Maps

Tables

Acknowledgments

This report is a product of the World Bank Water Global Practice's *Global Study on the Aggregation of Water Supply and Sanitation (WSS) Utilities* and forms part of the WSS Global Solutions Group's agenda on WSS utility turnaround. The study and this report have been developed by a team led by David Michaud (Practice Manager and Task Team Leader) and composed of Maria Salvetti (Lead Author), Carlos Diaz (WSS Utility Specialist), Gustavo Ferro (Conceptual Advisor), Michael Klien (Economist/Statistician), Berenice Flores (Project Analyst), and Stjepan Gabric (Senior Water and Sanitation Specialist). Alexandra Cassivi and Maria Rath (Junior Research Associates) conducted significant background data collection. Lise Lingo carefully edited the document. Carolina Delgadillo (Program Assistant) provided extensive support to the team. The activity was carried out under the general direction of Bill Kingdom (Global Lead for Water and Sanitation) and with valuable guidance from Gerard Soppe (Senior Water and Sanitation Specialist).

The development of the 14 case studies, encompassing seven countries, was made possible through the dedication of the following World Bank WSS specialists: Stjepan Gabric, Juliana Garrido, Ivaylo Kolev, Luis Macario, Antonio Rodriguez, and Irma Setiono, who led the development of the case studies by the team of local consultants consisting of Alizar Anwar (Indonesia), Andras Kis (Hungary), Dinis Juizo (Mozambique), Erica Ortiz (Colombia), Teodor Popa (Romania), Wilson Rocha (Brazil), and Henrique Zenha (Portugal).

Valuable comments and inputs were received from peer reviewers Caroline van den Berg, Xavier Chauvot, and Dambudzo Muzenda, as well as from other colleagues on the Advisory Team who provided continuous advice throughout the design, implementation, and write-up of this study: Masroor Ahmad, Oscar Alvarado, Luis Andres, Alexander Danilenko, Madio Fall, Martin Gambrill, Christiaan Heymans, Smita Misra, Gang Qin, Victoria Rigby Delmon, Gustavo Saltiel, Luiz Tavares, and Sophie Tremolet.

The team would like to thank the World Bank Water Global Practice Communications team, which jointly produced the complementary toolkit and its various features, available online through the World Bank webpage www.worldbank.org/water/aggregation-toolkit—particularly Lauren Core, who led this task under the guidance of Pascal Saura, and Li Lou and Erin Barrett. All web animations and other graphics were designed by Taylor Crisdale and Jesse Thomas from JESS3. The short videos for the case studies, available online, were produced under the leadership of Video Executive Producer Steve Dorst (Dorst Productions), Ashley Brook and the local team in Crews Control, and the unit producer in Brazil, Lucas Dantos. The team is particularly thankful to Henrique Zenha, Teodor Popa, Andras Kis, and Dinis Juizo, who provided essential in-country support to produce the short videos and blogs for the case studies.

This Global Solutions Group global study has been funded by the Water and Sanitation Program and the Danube Water Program, for which the team is grateful.

Executive Summary

The recently adopted Sustainable Development Goals (SDGs) set an ambitious agenda of providing universal access by 2030 to safely managed water supply and sanitation (WSS) services. Policy makers and sector practitioners know that the SDGs will be achieved only if service providers can provide better services at a lower cost. Yet, in the last decades, policy approaches to structuring service delivery at the right level have been conflicting: some countries have chosen to consolidate service provision centrally, hoping for greater professionalism and economies of scale, whereas others have chosen to decentralize and empower local governments in the hope that more local accountability would provide strong incentives for good services.

To reconcile those two apparently contrary trends, an increasing number of countries and local governments are turning, with varying degrees of success, to the aggregation[1] of local utility companies. Making utilities work together has been regarded as an opportunity to improve the cost efficiency and performance of service providers, thus making them more sustainable. There is ample empirical evidence in the literature on the existence of economies of scale in the WSS industry, at least up to a certain level. Furthermore, it seems that large utilities tend to operate at a lower unit cost and perform better than smaller ones. For instance, Abbot and Cohen (2009) found that significant economies of scale exist in the WSS industry. More recently, in a study analyzing the performance of WSS utilities in Africa, Van Den Berg and Danilenko (2015) found that size matters in achieving good performance. Two recent analyses based on IB-Net data for utilities in the Danube region (Klien and Michaud 2016) and in the Latin American and the Caribbean Region (Diaz and Flores 2015) showed lower unit costs for larger utility companies. These studies compare utilities serving cities of different sizes. It is not clear when the same scale effects are achieved by grouping a number of noncontiguous providers into a single, larger, provider. Many utility companies and countries embarking on such an aggregation processes have found that those benefits do not always materialize in practice and that the accompanying processes are arduous and fraught with political challenges.

A Global Study on the Aggregation of Water Supply and Sanitation Utilities

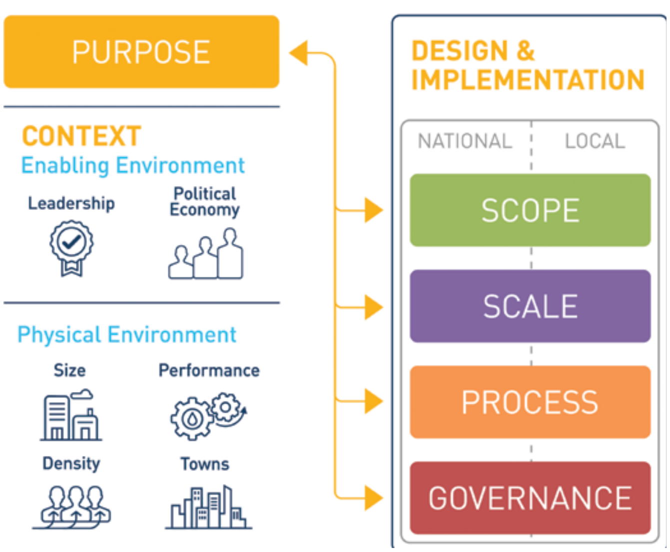
This global study was initiated to provide evidence-based guidance to policy makers and practitioners regarding when, why, and how water and sanitation utilities can work together (“aggregate”) to successfully deliver specific policy outcomes, such as better services or lower costs. This work does not advocate for or against aggregations but rather presents and reviews global evidence, analyzes specific aggregation case studies, and identifies the key characteristics that successful aggregations have in common, depending on their purpose and the context in which they occur. Acknowledging that it is challenging to make "before aggregation" and "after aggregation" cost comparisons because the levels of service are changing, this work focuses on proposing recommendations for successful aggregation, shaping lessons learned into a checklist of key questions to ask, and pointing out key decision points. The recommendations are based on evidence and observed experiences rather than theoretical considerations and sometimes run counter to conventional wisdom on aggregation practices.

This study consists of a review of literature and an analysis of both qualitative and quantitative evidence—including a statistical analysis based on IB-Net data covering 1,306 utilities from more than 140 countries; a review of global aggregation trends, collecting data for 111 countries; and 14 case studies from seven countries, providing a deep dive narrative of aggregation experiences.

Aggregation Typology

Expanding on the work done in World Bank (2005), this report postulates that the design of a successful aggregation should consider both the intended purpose and the context in which it takes place, and characterizes the design of an aggregation as a function of its scope, scale, process, and governance. This report defines a *successful aggregation* as one in which the aggregated service provider performs significantly better than the previously disaggregated entities with regard to the intended purpose, without unacceptable deterioration of other performance dimensions (figure ES.1).

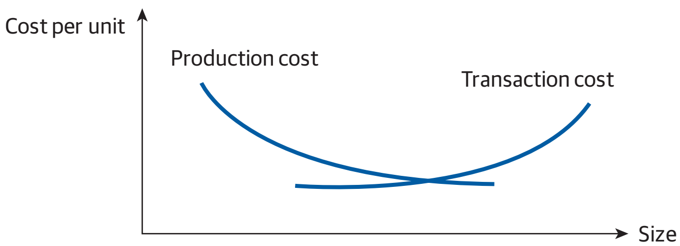
FIGURE ES.1. Context, Purpose, and Design of Aggregations



Understanding Why Success Does Not Always Materialize

There can be many reasons why an aggregation is not successful. Despite the potential for economies of scale, one-off or long-term transaction costs can prevent these economies from appearing.[2] Aggregation also has possible drawbacks, such as a loss in accountability and political reluctance, that may hamper the process, blocking it before it takes off or damaging it after launch. Clustering service areas increases the distance between the service provider and the end user. Salaries of employees in the agglomerated unit may be adjusted to reflect those of the highest-paying utility, which increases operating costs without necessarily creating equivalent efficiency gains. Lack of political will in aggregation reforms can arise when local authorities perceive such reforms as threats to their sovereignty.

FIGURE ES.2. Trade-Off between Production and Transaction Costs



Aggregations also make organizations more complex because the numbers of systems, employees, and processes can increase substantially. In addition, utility ownership—in the sense of the allocation of decision and control rights—tends to become more opaque. Instead of a single owner, several municipalities or regional entities share ownership or sign a lease agreement with a utility. Such fragmentation of control and decision rights can produce significant transaction costs.

In summary, although serving a larger number of customers has organizational advantages in the production process—which can materialize as economies of scale in lower unit costs or improved performance—greater size also implies higher transaction costs (Coase 1993; Williamson 1975; figure ES.2). This being said, it is important to bear in mind that the outcome of a given aggregation should be measured primarily against its original purpose, which might or might not involve economic efficiency. In some cases, it might be necessary to accept a permanent transaction cost or change in cost structure in return for an important externality; for example, a cross-subsidy between low- and high-cost service areas or an environmental benefit.

What are Global Aggregation Trends?

This study collected information on the provision and aggregation of water and sanitation services worldwide, from public sources (the Joint Monitoring Programme, the Organization for Economic Cooperation and Development, and World Bank databases) as well as a systematic review of publicly available information on the websites of national agencies in various countries. The overview provides country-specific data such as urban and rural population sizes as well as aggregation-specific information such as the number of WSS utilities, the population served, the government level that is formally responsible for providing WSS services, aggregation reforms adopted at the national level, the number of aggregation processes over the preceding five years, and the predominant process, purpose, scale, and scope of aggregation. Information was collected on 111 countries, representing 88 percent of the world's population and 51 percent of all countries. This review led to the following conclusions:

- The level of decentralization of WSS services increases in countries with higher levels of development and overall service coverage.
- Aggregation is a relatively recent trend mainly observed in African, European, and Latin American countries.
- Aggregations are happening in a diversity of contexts but are more frequent in countries with high WSS services coverage.

- The predominant aggregation type is a top-down, mandated process, targeted toward economic efficiency, encompassing all functions and services, following administrative boundaries, and taking the form of a merger.
- Aggregations in countries with limited sector performance are predominantly aiming at improving services, whereas in countries where the coverage is high, economic efficiency is the main driver.

When Do They Work? The Quantitative Evidence

A statistical analysis was conducted of IB-Net data, which cover 1,306 utilities from more than 140 countries, to understand in greater detail the potential gains from aggregation. Comprehensive time-series data for 79 aggregation cases identified in the data set were used to understand the effect of aggregations on disaggregated performance measures as well as differences in cost structure. The analysis comprised two complementary approaches: first, an empirical assessment of the performance consequences of aggregations, and second, a cross-sectional analysis to understand how the configurations of utility structure, which are subject to change in the aggregation process, determine long-term performance differences. This part of the statistical analysis classified utilities according to core structural characteristics and compared the performance of utility types.

The analysis of utility aggregations using IB-Net data shows that in some cases the reforms have led to both improved financial sustainability and performance, whereas in other cases the benefits did not materialize. The research also shows that most aggregations involve larger, urban utility companies taking over small, more rural towns, thus adding few customers and decreasing the density of the service area. In fact, utilities serving several towns do not see straightforward economies of scale when their size increases, unlike utilities serving a single town. In addition, the analysis of available empirical data found evidence that many aggregations do not generate lower labor unit costs per customer served in the way one would have expected given the potential economies of scale.

The empirical analysis of IB-Net data also shows that the effect of aggregations varies widely and does not automatically show lower unit cost or better performance, because of the emergence of significant transaction costs in some cases. These results derive from before-and-after comparisons of utilities that aggregated with similar utilities that did not. Looking specifically at the post aggregation period, there is some evidence that managerial efficiency tends to improve through aggregation. Additional statistical tests show that some utility types might benefit more than others and that the design of the aggregation matters:

- On the one hand, small, less complex aggregations and aggregations of utilities that already serve multiple towns are more likely to achieve cost savings.
- On the other hand, aggregations that involve small or weak utilities tend to improve those utilities' overall performance, rather than lowering their costs.

Why Do They Work? The Qualitative Evidence

To complement the hard data analysis, the study also investigated in greater detail 14 case studies in seven countries, focusing on the stakeholders involved, the decisions made, the roles of sector actors and their incentives, and the perceived outcomes, to highlight the essence of each case experience. The seven countries were Brazil, Colombia, Hungary, Indonesia, Portugal, Mozambique, and Romania. The selection of the countries and specific providers ensured a diversity of geography, development level, size, and aggregation process and scope. The availability of data was also a key selection criterion.

Among other findings, this analysis provides evidence that many of the observed aggregations started from a low-cost and low-performance situation, going through a higher-cost and higher-performance status before finally reaching the ideal high-performance and lower-cost scenario. The overall "reform path" was to improve performance first, and only secondarily to improve the cost situation.

Analysis of the 14 case studies identified the following success factors:

- Having a stable champion throughout the aggregation often improves the likelihood of success.
- Building ownership and aligning the interests of stakeholders at all levels is essential.
- Defining principles but allowing flexibility in implementation ensures local ownership.
- Results take time; gradual improvement strategies with a consequent focus on results are particularly successful.

The analysis also identified a series of risk factors that may prevent aggregation from delivering its benefits:

- Not acknowledging context and purpose when designing an aggregation can lead to failure.
- When political leadership changes over time, aggregation can be jeopardized.
- Harmonization of administrative practices may level performance down and costs up.
- Transaction costs can hamper aggregation success.
- Cherry-picking practices can undermine the outcome of an aggregation whose purpose involves externalities such as cross-subsidies or capacity transfers.

How Does WSS Utility Aggregation Work? Concrete Insights

The qualitative and quantitative analysis allowed a deep dive into the nuts and bolts of setting up a successful aggregated service provider, ranging from deciding on scale and scope, to allocating power, to managing assets and liabilities and harmonizing IT systems. Building on the aggregation typology—that is, the proposed four design dimensions of scope, scale, process, and governance—the study highlights the trade-offs and potential challenges associated with each of those design decisions.

Scope of Aggregation

The scope of aggregation varies among the case studies; however, in most, all functions have been aggregated. All stages of the service chain[3] have been aggregated in all the case studies except for Águas de Alentejo (Portugal), which only supplies bulk water and oversees wastewater treatment. Water and wastewater services have been aggregated in eight case studies. In four case studies, aggregation was limited to water service only, and in one case study, the operator is in charge of WSS as well as waste collection. Those findings are consistent with the findings of the global aggregation trends review.

Scale of Aggregation

The scale of aggregation follows administrative boundaries in 12 case studies; in the two Brazilian cases, aggregation happened within watershed limits and concerns only rural areas. The population covered varies from 32,000 in the regional market of La Línea (Colombia) to 2.2 million in the regional market of Atlántico (Colombia). In Brazil, where aggregations happened in rural areas, the case studies cover 89,500 inhabitants in 153 settlements for SISAR (Sistema Integrado de Saneamento Rural) and 303,000 inhabitants in 239 localities for COPANOR (COPASA Serviços de Saneamento Integrado do Norte e Nordeste de Minas Gerais), thus showing the low population density. In contrast, in Indonesia and Mozambique, where aggregations happened in urban areas, they exhibit high density (respectively 2.1 million inhabitants in seven cities for PDAM Tirtanadi and 400,000 in three cities for FIPAG Northern Unit). The number of towns covered in an aggregation varies widely among the case studies, ranging from 2 cities for PDAM Intan Banjar (Indonesia) to 239 for COPANOR (Brazil).

Process of Aggregation

The government mandated the process of aggregation in 4 case studies, all in the European Union; in all others, it was voluntary. Of the 14 case studies, 6 received financial incentives from donors and 4 received financial support from public funds; 2 received both donor aid and public subsidies. These financial incentives or support, when provided effectively, enabled the funding of large investment projects, which acted as a "Big Push" to improve WSS coverage, quality, and performance.

Governance of Aggregation

In most case studies, the aggregated utilities have adopted a corporatized structure and used a delegated governance arrangement. Variety arises in the distribution of shares and power (for example, according to the asset value transferred to the aggregated entity or the volume or the population served per participating municipality). In most cases, asset transfer has offered an opportunity to set up or update inventories. Similarly, costs and revenues are typically consolidated for the utility as a whole and tariffs harmonized across the operating area. In half of the case studies, no staff transfer occurred. Entry and exit rules typically are not stipulated clearly. Almost none of the aggregated utilities took on liabilities from previous operators.

FIGURE ES.3. **Stages of Aggregation and Key Actions**

Road Map To a Successful Aggregation

This study set out to provide concrete, evidence-based policy guidance on when, why, and how the aggregation of water and sanitation utilities can successfully deliver specific policy outcomes. It found that implementation is typically a long-term effort, taking anywhere from 3 to 20 years and involving, broadly speaking, four stages: (i) deciding whether aggregation is the appropriate policy instrument to achieve the purpose sought; (ii) designing the aggregation, (iii) implementing it, and (iv) sustaining its achievements (figure ES.3).

Key Messages

The evidence base is not always as conclusive and clear-cut as a policy maker would want. Some conclusions might appear counterintuitive or contradict conventional wisdom. This, in itself, is an important finding as it underlines the utility for policy makers and practitioners of pausing and thinking about reforms before replicating a model that might appear successful in a different context, for a different purpose.

A few broad conclusions can be derived from the overall analysis:

1. **Aggregation is a policy option, not a panacea for all sector challenges.**
2. **Aggregations come in many different shapes and forms, depending on the local circumstances.**

3. **The design of a successful aggregation will depend on the intended purpose of the aggregation, as well as on the overall context in which it takes place.**
4. **In the developing world, aggregation is primarily a means to deliver better services rather than to lower costs.**
5. **Aggregation is a gradual, long-term process that requires strong stakeholder commitment.**
6. **Finally, aggregations are most successful when accompanied by a broader sector reform addressing governance, financing, and regulatory issues at the sector level.**

This study does not provide a definitive answer to the questions of when, why, and how aggregation can successfully deliver specific policy outcomes. Aggregation is a relatively recent phenomenon, and understanding the long-term impact of aggregation requires data over a longer time series. Similarly, the data sets do not allow a complete understanding of the transaction costs that emerge during aggregations, how they evolve over time, and how best to mitigate them. Utilities aggregate for a wide variety of purposes, and the available data primarily allow an understanding of the effectiveness of aggregations only with regard to cost savings and performance improvements. And of course, the case studies demonstrate time and again the importance of a favorable political economy and overall country environment for the success of the process; more work is necessary in that regard.

Nevertheless, this study seeks to shed some light on the complexities and trade-offs associated with designing and implementing aggregation reforms, while providing relevant guidance on how to make such reforms as successful as possible. With that, the hope is that this work will enable policy makers and practitioners who are considering aggregation to better understand whether it is a relevant policy option for them, and to use the analysis and case studies to make more informed decisions about the design and implementation of the process.

Complementing this report is an online toolkit that offers a broader set of references and resources to inform aggregation processes (www.worldbank.org/water/aggregationtoolkit).

Notes

1. Aggregation is defined as the process by which two or more WSS service providers consolidate some or all their activities under a shared organizational structure, whether it implies physical infrastructure interconnection or not, and whether the original service providers continue to exist or not.
2. Transaction costs refer not only to the singular event when the utilities are merged but also to additional cost in the aggregated utility, which may arise repeatedly. Therefore, transaction costs are defined here as comprising all costs except production cost and may be divided into one-offs and costs incurred repeatedly (Coase 1993; Williamson 1975).
3. Aggregated utilities can supply only stages of water and wastewater services; that is, production, distribution, collection, or treatment (World Bank, 2005).

Abbreviations

AMGAP	Associação de Municípios para a Gestão da Água Pública do Alentejo (Association of Municipalities for the Management of Alentejo Public Waters)
BOT	build, operate, transfer
BWC	Brasov Water Company
EU	European Union
IB-Net	International Benchmarking Network for Water and Sanitation Utilities
IDA	Intercommunal Development Association
IQS	index quality standard
IRCA	risk index of drinking-water quality
IT	information technology
PPP	public-private partnership
OPEX	operational expenditures
PDAM	Perusahaan Daerah Air Minum (regional water utility company)
ROC	regional operating company
SDGs	Sustainable Development Goals
SOP E	Sectoral Operational Programme Environment
WHO/UNICEF	World Health Organization/United Nations Children's Fund
WSS	water supply and sanitation
WUPI	Water Utility Performance Index

Chapter 1

Why This Report?

Background

The recently adopted Sustainable Development Goals (SDGs) set forward an ambitious agenda of providing universal access to good-quality water supply and sanitation (WSS) services within a financially constrained environment. Policy makers and sector practitioners know that the SDGs will be achieved only if service providers can provide better services at a lower cost. Yet, the last decades' policy approaches to structuring service delivery at the right level have been conflicting: some countries have chosen to consolidate service provision centrally, hoping for greater professionalism and economies of scale, whereas others have chosen to decentralize and empower local governments in the hope that more local accountability would provide strong incentives for good services.

In an effort to reconcile those two apparently contrary trends, an increasing number of countries and local governments are turning, with varying levels of success, to the aggregation[1] of local utilities companies. Making utilities work together has been seen as an opportunity to improve the cost efficiency and performance of service providers, thus making them more sustainable. As a matter of fact, there is ample empirical evidence in the literature on the existence of economies of scale in the WSS industry, at least up to a certain level. Furthermore, it seems that large utilities tend to operate at a lower unit cost and perform better than smaller ones. For instance, Abbot and Cohen (2009) found that significant economies of scale do exist in the WSS industry. More recently, in a study analyzing the performance of WSS utilities in Africa, Van Den Berg and Danilenko (2015) found that size matters in achieving good performance. Two recent analyses based on IB-Net data for utilities in the Danube region (Klien and Michaud 2016) and in the Latin American and the Caribbean Region (Diaz and Flores 2015) showed lower unit costs for larger utility companies. Yet, many utility companies and countries embarking on aggregation processes have found that those benefits do not always materialize in practice and that the accompanying processes are arduous and fraught with political challenges.

This Report

This report and the accompanying online toolkit aim to provide **concrete, evidence-based guidance** to policy makers and practitioners about **when, why, and how water and sanitation utilities can work together ("aggregate") to successfully deliver specific policy outcomes, such as better services or lower costs.** The report highlights the various policy outcomes that can be expected from a successful aggregation, such as improved performance, lower costs, or solidarity between user categories. It underlines the trade-offs between those potential improvements. It also lays emphasis on the context in which aggregation purposes are most likely to be achieved, and how the purpose and the context must be taken into consideration when designing aggregations.

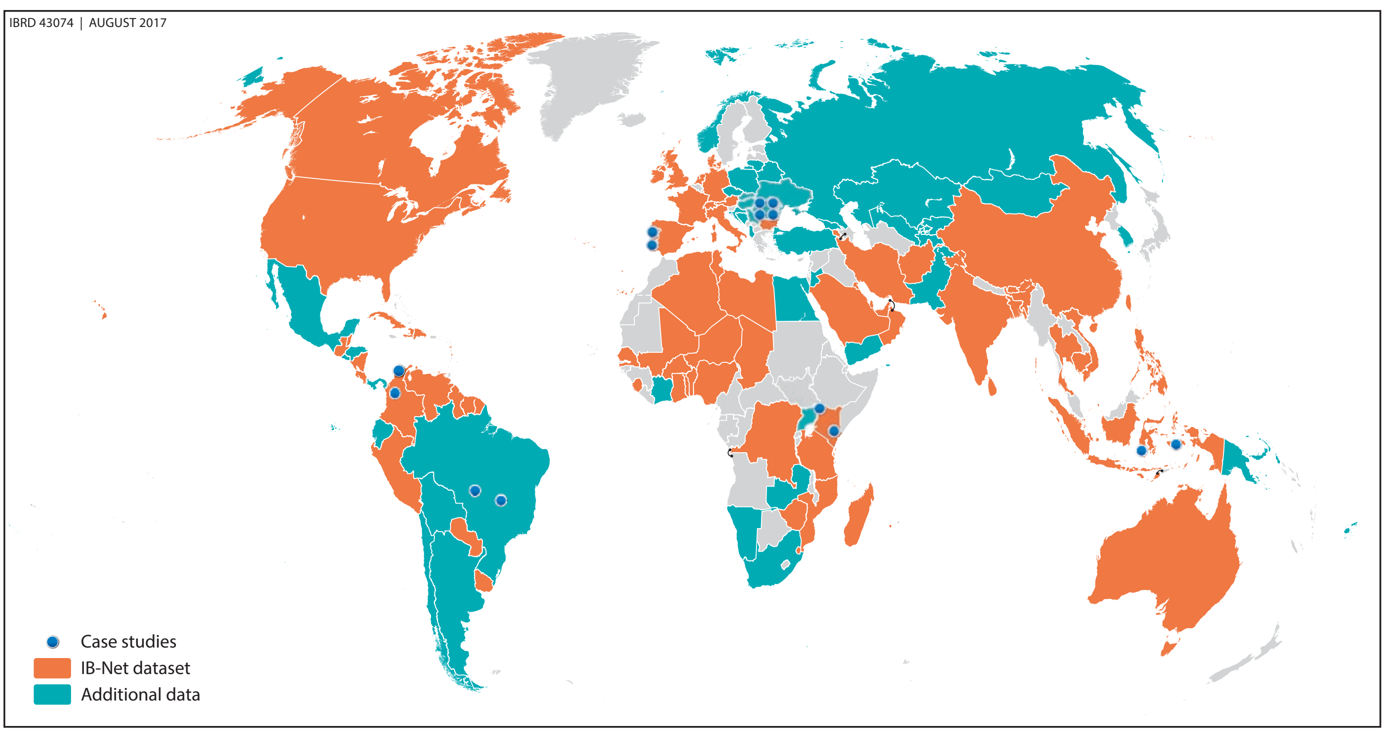
This report does not advocate for or against aggregations; rather, it presents and reviews global evidence, analyzes specific aggregation case studies, and identifies the key characteristics that successful aggregation processes have in common. Those recommendations are based on actual evidence and observed experiences rather than theoretical considerations; and some put in question conventional wisdom with regard to aggregation practices.

This report builds on previous work from the World Bank and others. In particular, it borrows significantly from the conceptual framework and practical typology proposed by the report, *Models of Aggregation for Water and Sanitation Provision, Water Supply and Sanitation Working Notes* (World Bank 2005). The report also considers a significant external literature concerned with the issue of economies of scale and the more limited set of publications dealing with actual aggregation processes and their varied successes (see box 4.3). A complete literature review is available in the online toolkit, which provides resources to support aggregation processes.

The Evidence Base

This report builds on a review of literature and an analysis of both qualitative and quantitative evidence, a global data set of international trends, a utility performance database, and a series of case studies. The evidence-based materials encompass data and information collected for a wide range of countries all around the world, with various income levels (map 1.1).

MAP 1.1. Data Collected for the Global Study



A Review of International Aggregation Trends

The study collected information on the provision and aggregation of water and sanitation services worldwide. The information was collected from public sources (such as the Joint Monitoring Programme, the Organization for Economic Cooperation and Development, and World Bank databases), as well as a systematic review of publicly available information on the websites of national agencies in the various countries. The data and information were subsequently validated internally by World Bank staff working in all regions. The overview provides country-specific data such as urban and rural population sizes as well as aggregation-specific information covering items such as the number of WSS utilities, the population served, the government level formally responsible for providing WSS services, aggregation reforms adopted at the national level, the number of aggregation processes over the preceding five years, and the predominant process, purpose, scale, and scope of the aggregation. Information was collected on 111 countries, representing 88 percent of the world's population and 51 percent of all countries. The entire data set is available publicly in the toolkit.

A Statistical Analysis of the IB-Net Utility Performance Data Set

A statistical analysis based on IB-Net[2] data, which cover 1,306 utilities from more than 140 countries, was conducted to understand in greater detail the potential gains from aggregation. Comprehensive time-series data for 79 actual aggregation cases identified in the data set were used to understand the effect of aggregations on disaggregated performance measures as well as differences in the cost structure. The statistical analysis comprised two complementary approaches: first, an empirical assessment of the performance consequences of aggregations, and second, a cross-sectional analysis. This replicated the regional analysis by Klien and Michaud (2016) at the global level, using the full IB-Net database. Here the focus was to compare how performance evolved for utilities that grew through aggregation versus utilities that were not aggregated. The cross-sectional analysis, complementing the empirical assessment, aimed to understand how the different configurations of utility structure, which are subject to change in the aggregation process, determine long-term performance differences. This part of the statistical analysis classified utilities according to core structural characteristics and compared the performance of the utility types. A detailed description of the methodology of the statistical analysis is available in appendix B. A supporting paper is also available in the online toolkit.

A Set of 14 Case Studies

To overcome the limitations of hard data analysis, the study also investigated in greater detail a set of 14 case studies in seven countries, centering on the stakeholders involved, the decisions made, the roles of sector actors and their incentives, and the perceived outcomes with a view to bringing forward the essence of each case experience. The seven countries were Brazil, Colombia, Hungary, Indonesia, Portugal, Mozambique, and Romania. The selection of the countries and specific providers was done in a manner to ensure a diversity of geography, development levels, size, and aggregation process and scope. Availability of data was also a key selection criterion. The main characteristics of the selected case studies are presented in appendix A. A detailed narrative of each case study is also available in the online toolkit.

How to Use this Report and the Toolkit

The report is structured as follows:

- **Chapter 2** introduces the concepts and typologies underlying the rest of the report, including aggregation definition and typology, classifying the possible purposes, scales, scopes, and processes of aggregation.
- **Chapter 3** provides a descriptive overview of aggregation trends around the world.
- **Chapter 4** presents the quantitative findings on the impact of aggregation processes with regard to performance improvements and cost reductions.
- **Chapter 5** discusses lessons learned from the qualitative review of aggregation processes with regard to success and risk factors for aggregation processes.
- **Chapter 6** describes in greater detail how some of the process's core design challenges—from appropriate scale and scope, to voting rights, staff management, and asset and liability distribution—can be addressed effectively.
- **Chapter 7** proposes a consolidated set of guiding principles and a step-by-step road map to a successful aggregation, and **chapter 8** presents the main conclusions.

Readers interested primarily in the concrete policy guidance emerging from the evidence should focus on chapters 6, 7, and 8; chapters 3, 4, and 5 provide a more comprehensive overview of the evidence emerging from the three building blocks of the study; and chapter 2 focuses on definition and concepts. Key lessons learned are clearly identified as such throughout the report. A series of boxes contain relevant evidence or examples that are beyond the scope of the study.

The report includes appendixes of immediate relevance to the reader: appendix A presents a table summing up the key characteristics and results of the 14 case studies and appendix B presents the methodology of the statistical analysis on aggregation conducted using IB-Net data.

This report is complemented by an online toolkit, which offers a broader set of references and resources to inform aggregation processes, including, among others, these elements:

- Main feature video with information about the purpose of the report and thoughts from leading voices from around the world
- Supporting documents on the aggregation of WSS utilities, displaying the results of the statistical analysis
- A literature review and an annotated bibliography on the aggregation of WSS services

- 14 case studies that present the knowledge gathered through the report in multiple political, economic, and environmental contexts
- Multimedia field stories, including three short videos sharing concrete experiences in WSS utility aggregation
- An engaging visual representation of *Aggregation Global Trends* in an interactive map displaying the data set on the aggregation or fragmentation of the water sector in more than 111 countries
- Q&As with diverse global practitioners that provide concrete advice and unique glimpses into firsthand experiences with utility aggregation in multiple contexts

Notes

1. For definitions of key concepts, refer to chapter 2.
2. The International Benchmarking Network for Water and Sanitation Utilities (IB-Net) is an initiative to encourage water and sanitation utilities to compile and share a set of core cost and performance indicators, and thus meet the needs of various stakeholders. It sets forth a common set of data definitions and a minimum set of core indicators, and provides software to enable easy data collection and calculation of the indicators. It also provides resources for analyzing data and presenting results.

Chapter 2 Aggregations, Basic Concepts

This chapter provides definitions of the basic concepts used in the rest of the report. It also outlines the typology used to understand and characterize aggregation processes, as well as evaluate their outcomes.

Definition of Aggregation

Definition

In the context of this study, aggregation is defined as **the process by which two or more WSS service providers consolidate some or all their activities under a shared organizational structure**, whether it implies physical infrastructure interconnection or not, and whether the original service providers continue to exist or not (figures 2.1, 2.2, and 2.3).

Aggregation, as defined in this report, can encompass a large variety of situations. A classic example is the full merger of several service providers into a new entity (figure 2.1).

Aggregation also covers a number of other circumstances. For instance, several service providers can aggregate to build a common treatment plant facility or create a common WSS system (figure 2.2).

Service providers can also choose to aggregate only specific functions, for example, operation and maintenance of their vehicles and heavy equipment machinery (figure 2.3).

For this study, service providers that cooperate on an ad hoc basis and do not share or set up a common organizational structure are not considered as aggregating. Likewise, this study defines aggregation as a process rather than a situation, meaning that service providers that were established at a specific level from the beginning (for example, the national utility companies established in some Western African countries) are also not considered aggregated.

Fragmentation of Service Provision and Aggregation Index

To measure the degree of fragmentation of service provision of the water sector in a country, we take into account the fact that WSS services are usually considered as local services and propose a simple normalized index based on the number of local governments and the number of service providers.

$$A = 1 - \frac{U/M}{(U/M)+1}$$

Where

U is the number of service providers in the country

M is the number of local governments in the country

A is a normalized aggregation index ranging from 0 to 100, with a value of 0 indicating a fully atomized sector with many more utility companies than local governments, a value of 50 indicating the same number of utilities and local governments, and a value of 100 indicating a single national utility.

The purpose of the aggregation index is to estimate whether a country has predominantly disaggregated or aggregated utilities.

Typology

Policy makers usually pursue a specific purpose or set of purposes when they decide to promote aggregation. When they conduct the aggregation process, they consider the enabling and physical environments in which it is being conducted. Therefore, this report postulates that the *purpose* and *context* both influence the *design* of the aggregation process and that the design of the aggregation can be characterized by its *scope*, *scale*, *process*, and *governance* (figure 2.4). The typology is used consistently throughout the report.

Context and Purpose of Aggregations

Context of Aggregation

The context in which aggregations take place is characterized by the *enabling environment* in the country and in the sector. This enabling environment comprises factors such as the level of development and of income, the water-related environmental standards in force, the political will and leadership at both national and local levels, the institutional setup of the water sector with regard to WSS provision, policy-making responsibilities, regulation, and so on. The context

FIGURE 2.1. Aggregation Example—Aggregation of All Functions and Stages

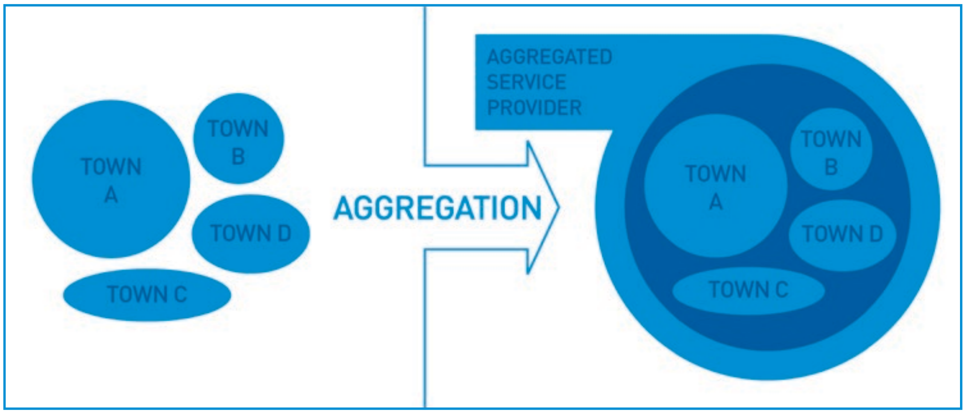


FIGURE 2.2. Aggregation Example—Aggregation of All Functions and Some Stages

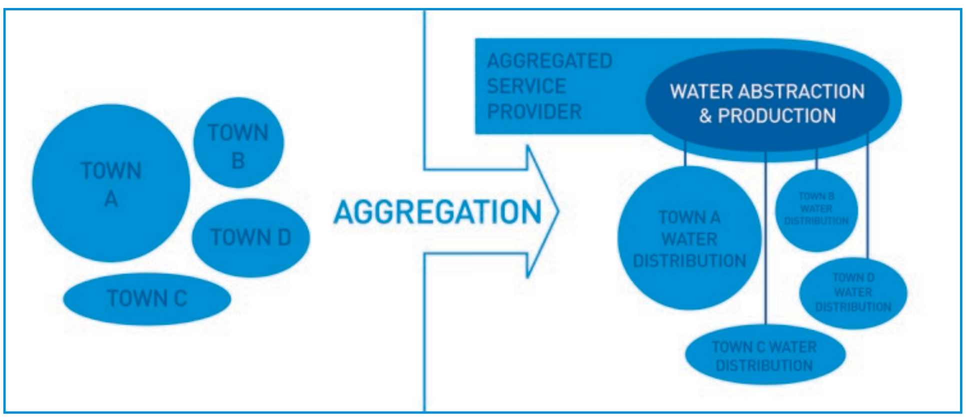


FIGURE 2.3. Aggregation Example—Aggregation of Some Functions for All Stages

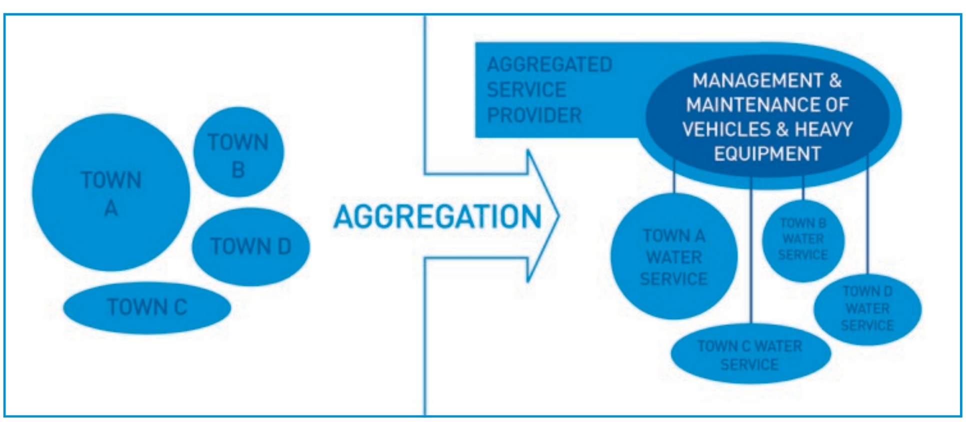
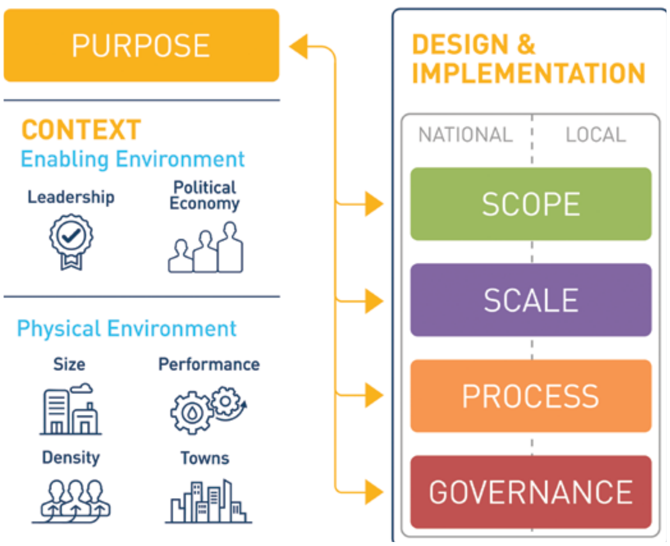


FIGURE 2.4. Context, Purpose, and Design of Aggregations

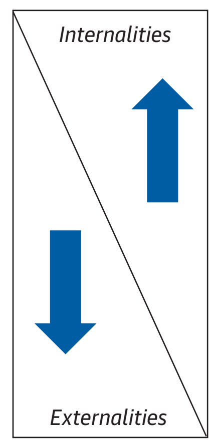


of aggregation is also characterized by the *physical environment* in which utilities operate. This physical environment encompasses the size of utilities, their level of performance, the population they serve, the number of towns in their operating area, the quality and quantity of water resources, and other factors. As discussed in subsequent chapters, policy makers should carefully consider context because it influences the design of reforms.

Purpose of Aggregation

Aggregations can be distinguished by their purpose (see figure 2.2). Not all aggregations are pursued for the same purpose; in fact, the study shows that the purposes that decision makers pursue differ significantly from one case to another. The main ones include the following:

- **Economic efficiency,** which seeks lower unit costs, through economies of scale or economies of scope or more effective investment strategies
- **Performance[1] improvement,** which covers technical and managerial aspects of service quality and considers customer satisfaction
- **Professionalization,** which targets **technical capacity enhancement** and addresses bottlenecks caused by scarcity of human capital
- **Environmental benefits,** seeking integrated water resources management by sharing sources or reducing pollution
- **Solidarity,** to cross-subsidize investments between regions or social groups so as to extend coverage and/or recover operation and maintenance costs



Aggregation is thus sometimes motivated by (mostly local) stakeholders seeking to generate positive internalities and sometimes by external or national stakeholders seeking to generate positive externalities.

- **Economic efficiency** is likely to generate positive internalities for a utility as reducing operating expenditures (OPEX) can allow the reallocation of some resources to investments to improve asset management and sustainability.
- **Performance improvement** and **professionalization** are likely to generate internalities but also externalities. For instance, improved water service continuity, reduced sewerage blockages, improved drinking-water quality, and improved wastewater treatment quality generate in customers a higher willingness to pay, thus improving the invoice collection ratio. The utility is able to collect more revenues, improving its sustainability.

Performance improvement also generates economic and social externalities, as it improves health conditions for the connected population, reduces pollution discharged in the environment, and increases water availability for economic activities.

- Aggregation aiming at **environmental benefits** or **solidarity** generates economic, social, and environmental externalities. Extension of coverage brings better health conditions and greater water availability for economic activities.

Often, decision makers pursue more than one purpose; however, the combination of different purposes may not always be possible. Aggregation that targets quality and technical capacity improvement often induces large investment programs, which tend to increase OPEX. Thus, enhancing economic efficiency and performance at the same time may sometimes be contradictory, especially when a utility is trapped in a low-level equilibrium (box 2.1). As will be discussed in subsequent chapters, the design of the aggregation with regard to scope, scale, process, and governance should depend closely on the purpose sought (figure 2.5).

BOX 2.1. Low-Level Equilibrium Concept and the Big Push

As described by Savedoff and Spiller (1999), the WSS water sector in many developing countries is stuck in a low-level equilibrium. In such situations, low tariffs are associated with low quality, low service expansion, and general operational inefficiency. The term "equilibrium" indicates that without a reform of the sector's setup, there is no movement toward improved water services.

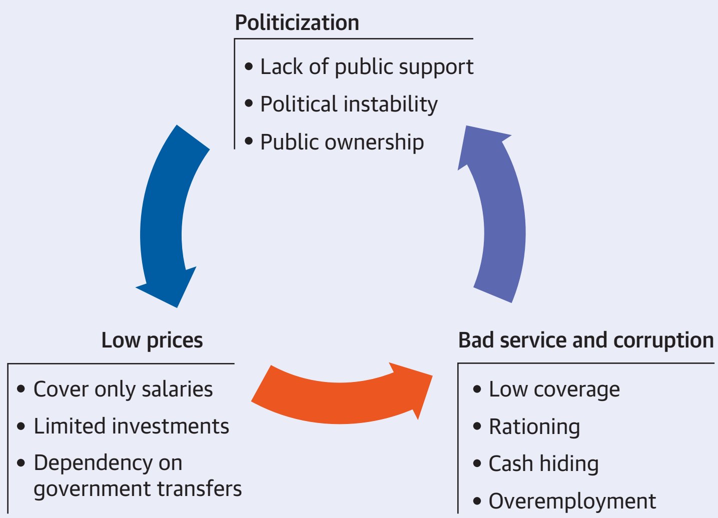
This phenomenon originates in incentives for governments to behave opportunistically. By lowering tariffs or resisting tariff increases, they can reap short-term political benefits such as electoral gains, so they will support the status quo over costly political actions that might involve higher water rates in the short run and yield diffuse benefits in the longer term. Moreover, in such circumstances consumers are relatively dispersed and too disorganized to assume an active role in holding the water authority accountable. They also are unwilling to spend more on bad-quality services that they see as wastefully managed. In turn, this creates incentives for water companies to operate inefficiently regardless of whether they are public or private companies (figure B2.1.1).

To get out of the low-level equilibrium, policy makers can implement various strategies, such as improving the regulatory environment or limiting government opportunism. Following the low-level equilibrium trap theory developed by Nelson (1956), large investment programs can act as a "Big Push" that enables underdeveloped sectors to get out of the trap and embark on a development path.

box continues next page

BOX 2.1. continued

FIGURE B2.1.1. Low-Level Equilibrium



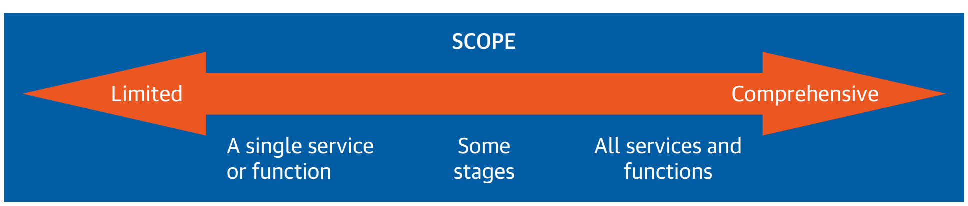
Source: Savedoff and Spiller 1999: 14.

Design of Aggregations

Expanding on the work done in World Bank (2005), this report characterizes the design of an aggregation in function of its scope, scale, process, and governance (see figure 2.4), as discussed in the following paragraphs.

FIGURE 2.5. Purpose of Aggregation

FIGURE 2.6. Scope of Aggregation



Source: World Bank 2005.

Scope of Aggregation

Aggregation of WSS utilities can cover various **scopes** (figure 2.6).

- They can execute few or all **functions** associated with these services; that is, operational, administrative and commercial, and investment and finance (figure 2.7).
- Aggregated utilities can provide various **services**: water only, wastewater only, or water and wastewater. They can also provide water and/or wastewater services as well as other local public services.

- Aggregated utilities can supply only **stages** of water and wastewater services; that is, production, distribution, collection, or treatment (figure 2.8).

Scale of Aggregation

The **scale** of WSS aggregation can vary widely, covering several municipalities or up to the whole national territory (figure 2.9).

- Aggregation can cover **a group of local jurisdictions** following administrative boundaries. These jurisdictions may or may not be contiguous. If they are, this can imply physical interconnection of networks, and administrative and commercial consolidation.
- Aggregation can cover a whole **region** or the entire **national territory** where a single utility is providing services following administrative boundaries.
- Aggregation can be implemented at the **watershed level,** following water catchment boundaries, thus putting the emphasis on integrated water resources management as well as wastewater discharge control.

Process of aggregation

Aggregation can be distinguished according to the type of **process** followed (figure 2.10).

- The process can be **mandated**—and thus top-down driven—and initiated by national authorities,

FIGURE 2.7. Key Operating Functions that Can Be Aggregated

Operations	• Routine system operation • Maintenance • Quality control • Commercial functions • Customer billing • Customer relations
Management	• Financial and technical management • Strategic planning and capital works design • Human resources • Legal departments
Procurement	• Regular or specialized inputs • Goods and services (including carrying out of supervision of large works)
Investment	• For either maintenance operations or new projects • For either projects at the municipal level or shared projects (especially including large water resource or sewerage schemes that cannot be managed at the level of the single municipality)
Financing	• For identifying and procuring financial sources

Source: World Bank 2005.

FIGURE 2.8. Services and Stages that Can Be Aggregated

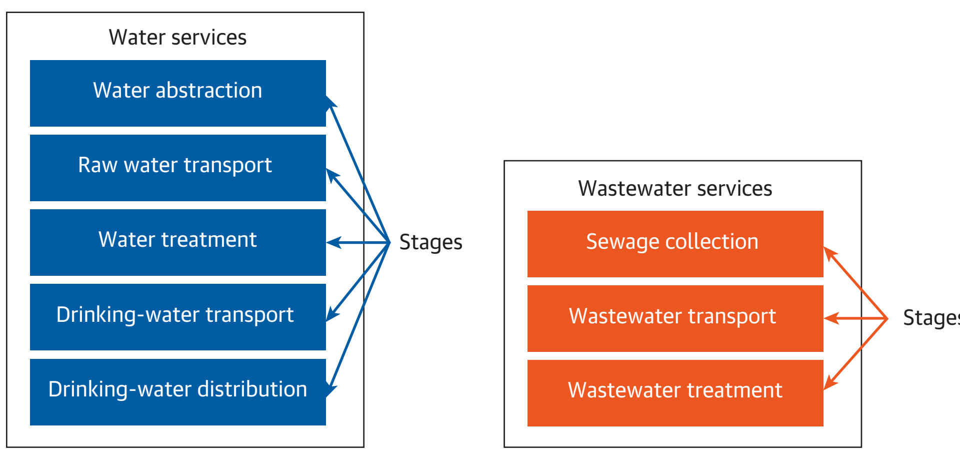
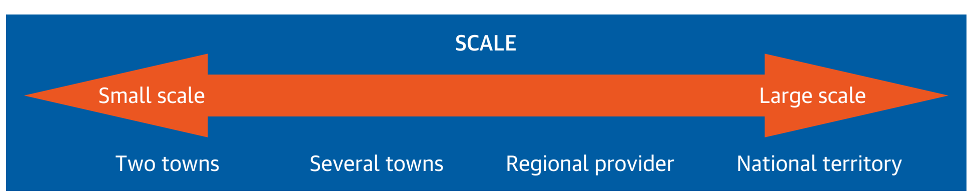


FIGURE 2.9. Scale of Aggregation



Source: World Bank 2005.

FIGURE 2.10. Process of Aggregation

Source: World Bank 2005.

which design a legally binding legal framework for aggregation.

- It can be **mandated and supported financially** by national or supranational entities, when those entities consider the provision of additional support as relevant.
- It can be **voluntary and incentivized** by public subsidies, external funding, or technical assistance stemming from national or supranational stakeholders.
- It can be **voluntary,** deriving only from a bottom-up initiative, stemming from utilities or local actors without a national framework to encourage it.

These processes form a continuum from bottom-up to top-down processes. Moreover, supranational and national incentives can be aligned to generate better results. For example, national actors can produce national policy guidance stating that aggregation is an eligibility criterion for external or national funding.

The first three categories represent cases in which the national government is actively promoting aggregation processes, while the fourth is characteristic of environments where the national government has no specific policy views on aggregation processes, which then happen from the bottom up, driven by utility companies or local actors' own interests.

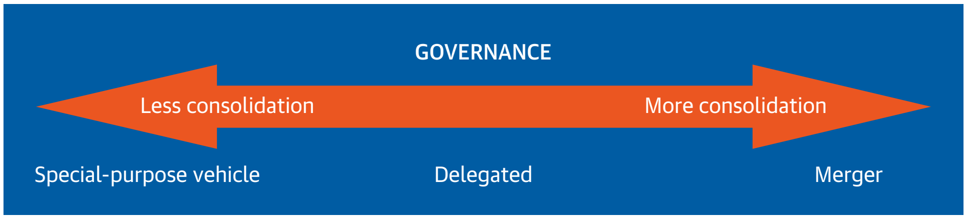
Governance of Aggregation

When aggregating utilities, various governance aspects have to be dealt with. The main ones relate to institutional elements; financing, assets, and liabilities; and harmonization of processes and practices.

Institutional elements

- **Legal form and organization:** Service providers have to define and agree on the legal and institutional structure of the aggregated utility. Three broad categories of aggregation arrangements have been identified (figure 2.11):
  - A *special-purpose vehicle*—that is, a specific cooperation agreement between service providers who remain separate entities, with a well-defined scope (for example, managing a specific facility)
  - A *delegated contract* signed between the jurisdiction level in charge of service delivery and a private or public operator, transferring all or most of the operational responsibilities, but maintaining the original entities
  - A *merger,* by which original service providers consolidate into a single entity and disappear

FIGURE 2.11. Governance of Aggregation



- **Shareholder rights and power distribution:** Depending on the legal form and organization chosen for the aggregation, shares and powers are allocated among aggregating entities to allow decision making.
- **Oversight and coordination of tariff and performance:** Tariff and performance are generally overseen by a board of directors or the general assembly of the utility, which often includes representatives of municipalities in which the utility operates, or by a national regulator.
- **Role of citizens and customers:** Communication and information flows between the aggregated utility and customers can be materialized in formal accountability measures and mechanisms.
- **Exit and entry clauses:** Clear entry and exit rules on joining or leaving the aggregation have to be set. They commonly include an asset inventory as most exit clauses anticipate the repayment of depreciation costs when investments have been made.

Financing, Assets, and Liabilities

- **Cost- and revenue-sharing agreements:** Rules on sharing costs and revenues must be clearly established among aggregating entities. They vary according to the degree of integration of service providers.
- **Asset ownership, transfer, development, and management** (royalties, investment decisions, and so on): Assets transferred to the aggregated entity should be inventoried. This transfer may be remunerated. Rules regarding investment allocation and priorities must be clearly set out.
- **Liabilities:** Service providers that are aggregating may hold debts to suppliers and financiers or claims on customers. These liabilities can be taken on by the aggregated utility or local government budgets, or not at all.

Harmonization of Processes and Practices

- **Staffing and human resources management:** Transfer of staff from municipal structures into the aggregated utility must be planned and documented in quantitative and financial terms, including possible pension liabilities.
- **Information technology (IT) systems (customer database, asset inventory, billing and collection system):** The aggregation agreement should include clear costing information as well as the strategy for harmonizing and integrating IT systems and managing databases.
- **Administrative practices, quality standards, procurement, and the like:** A harmonization strategy for administrative practices, such as procurement, accounting, and quality control must be set up ahead of the aggregation implementation.

Defining and Understanding a Successful Aggregation

What does Success Look Like?

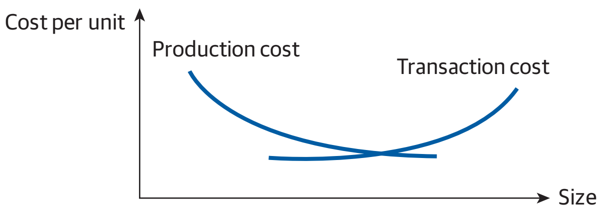
To analyze the evidence, it is important to first define a successful aggregation process. The degree of success should be assessed and measured against the main purpose(s) of the aggregation. This report defines **a successful aggregation as one in which the aggregated service provider performs significantly better than the previously disaggregated entities with regard to the intended purpose, without unreasonable deterioration of other performance dimensions**. For example, if the aggregation purpose is to improve economic efficiency by achieving economies of scale (and/or scope), the aggregation process will be successful if the new, aggregated structure achieves significantly lower unit costs without unreasonable[2] deterioration in other dimensions such as solidarity or service quality.

Why Does Success Not Always Materialize?

There can be many reasons why an aggregation is not successful. Despite the purely technical arguments for economies of scale, aggregation does have possible drawbacks, such as loss in accountability and political reluctance that may hamper the process of aggregation, blocking it before it takes off or damaging it after it is launched. Clustering service areas increases the distance between the service provider and the end user. Salaries of the agglomerated unit might be adjusted to reflect those of the highest-paying utility, which increases operating costs without necessarily creating equivalent efficiency gains. Lack of political will in aggregation reforms can arise if local authorities perceive such reforms as a threat to their sovereignty. Aggregations also make utility organizations more complex because the numbers of systems, employees, and processes can increase substantially. In addition, utility ownership—in the sense of the allocation of decision and control rights—tends to become more complex. Instead of a single owner, several municipalities or regional entities share ownership or sign a lease agreement with a utility. Such fragmentation of control and decision rights can entail significant transaction costs.

In summary, although serving a larger number of customers has organizational advantages in the production process for utilities—which can materialize as economies of scale in lower unit costs or improved performance—greater size also implies higher transaction costs (Coase 1993) (Williamson 1975). Moreover, the concept of transaction cost implies that utilities of different size represent trade-offs between production and transaction costs. Whereas production costs typically fall with size, transaction costs tend to increase. The optimal degree of aggregation is then the point where the sum of production and transaction costs is minimized (figure 2.12). The optimal size, however, depends on the context and therefore varies across a country and over time. Indeed the context will influence the level of production (through the quality and quantity of water resources, for instance) and transaction costs (through the size and performance of aggregating utilities, for instance) and, as such, will have to be taken into account to ensure aggregation success.

FIGURE 2.12. Trade-Off Between Production and Transaction Costs



One-Off Transaction Costs (Linked with the Aggregation Process)

In the framework of an aggregation, one-off transaction costs encompass the following three broad categories (Dahlman 1979):

- Before aggregation, **research and information costs** incurred to find and gather information on the service providers to aggregate with. In the context of this study, the entire design phase of the aggregation would fall in this category.
- During aggregation, **bargaining costs** corresponding to the negotiations necessary to reach an agreement among aggregating utilities and translate it into legal provisions and binding documents, as described in the list about governance earlier. This might lead, in concrete terms, to suboptimal solutions, such as the commitment to take over unnecessary staff or liabilities to make the bargain more palatable to the various parties.
- After aggregation, **enforcement costs** corresponding to the costs necessary to implement aggregation and make sure that all aggregating parties comply with their commitment and duties. They could, for example, entail the harmonization of salaries to a higher level or the costs of setting up new systems and procedures.

Long-Term Transaction Costs (Consequences of the Aggregation)

Several long-term transaction costs can be distinguished (Canback 2003) and applied to aggregation situations:

- **Bureaucratic insularity:** As utilities grow, senior managers are less accountable to the lower ranks of the organization and to shareholders. Particularly in large utilities with well-established procedures and rules, individual rent seeking is possible. This relates also to the frequent finding that managers in large organizations tend to emphasize size over profitability.
- **Motivational aspects ("atmospheric consequences"):** Increasing size brings increasing specialization, which in turn leads to reduced commitment from employees. Employees in large organizations often have a hard time understanding the purpose of corporate activities, as well as their individual contribution.
- **Communication distortion due to bounded rationality[3]:** As utilities grow, complexity increases. Hierarchical layers are added to manage the increasing complexity. Inevitably, these layers distort the flow of information. This limits the information available to executives, which Williamson (1975) called a loss of control.

In addition to such "classic" diseconomies of scale, which can arise as a single utility grows, aggregations add complexity to the organizational structure, thereby adding to transaction costs. Among the most important characteristics that change through consolidation:

- **Dealing with fragmentation of ownership:** The fact that an aggregated utility serves several municipalities requires the formulation of decision rules for the shareholders and the allocation of voting power. Various schemes for the distribution of voting rights are possible, but in all cases the distribution requires additional bureaucratic procedures and mechanisms to deal with multiple instead of single owners.
- **Heterogeneous initial conditions and heterogeneous preferences:** Municipalities for which service is bundled through an aggregation might have widely varying initial performance, service quality, and states of infrastructure. This raises questions about whether to apply the same policies to all utilities and how to prioritize investments and service improvements. To some extent, local preferences with respect to service provision may differ. How the management of the aggregated utility responds to these challenges might vary from case to case, but the utility needs conflict resolution mechanisms to align interests and arbitrate between those that diverge. This adds again to organizational complexity and decision-making costs.
- **Complicated cost- and revenue-sharing mechanisms:** As more municipalities are involved in an aggregation, possibly complicated cost- and revenue-sharing systems must be set up and adapted over time. Apart from the administrative burden, such a system also reduces transparency between service delivery and the price paid for the service, particularly if cross-subsidization between municipalities is pursued. Cost-sharing mechanisms give each municipality an incentive to attract as much investment and expenditure (public work contracts) as possible, regardless of whether or not the investment is sensible. These so-called common pool problems become more pronounced, the larger and more complicated the cost-sharing mechanisms are.

All in all, it is important to measure the outcome of a given aggregation primarily against its original purpose, which may or may not involve economic efficiency. In some cases, it might be necessary to accept a permanent transaction cost in return for an important externality; for example, a cross-subsidy between low- and high-cost service areas or an environmental benefit.

Notes

1. For the purpose of this study, the performance of a WSS utility is defined as its ability to provide cost-effective, good-quality service to the population in its service area. It is measured through an aggregate Water Utility Performance Index (WUPI) measuring three distinct dimensions—the coverage, quality, and efficiency of services provided. For more details, refer to box 4.1.
2. As discussed further in later sections, some level of deterioration might be unavoidable when externalities are involved; for example, the improvement of service quality might involve increases in costs.
3. Bounded rationality conveys the idea that individuals have a limited rationality when making choices.

Chapter 3

What are Global Aggregation Trends?

This chapter presents the main findings of the review of international aggregation trends, which was conducted by collecting data and information for 111 countries around the world (table 3.1), exhibiting a diversity of income levels (table 3.2) and covering 88 percent of the world's population (map 3.1). Information was collected exclusively from publicly available sources (international databases such as the World Bank World Development Indicators and the WHO/UNICEF Joint Monitoring Programme), regional and sector databases such as those of the Organization for Economic Cooperation and Development or a regional study on countries in the Danube region (World Bank 2015), and national publications and websites. All data were validated by Bank staff and are available in the online toolkit.

TABLE 3.1. Regional Representativeness of International Aggregation Trend Data Set

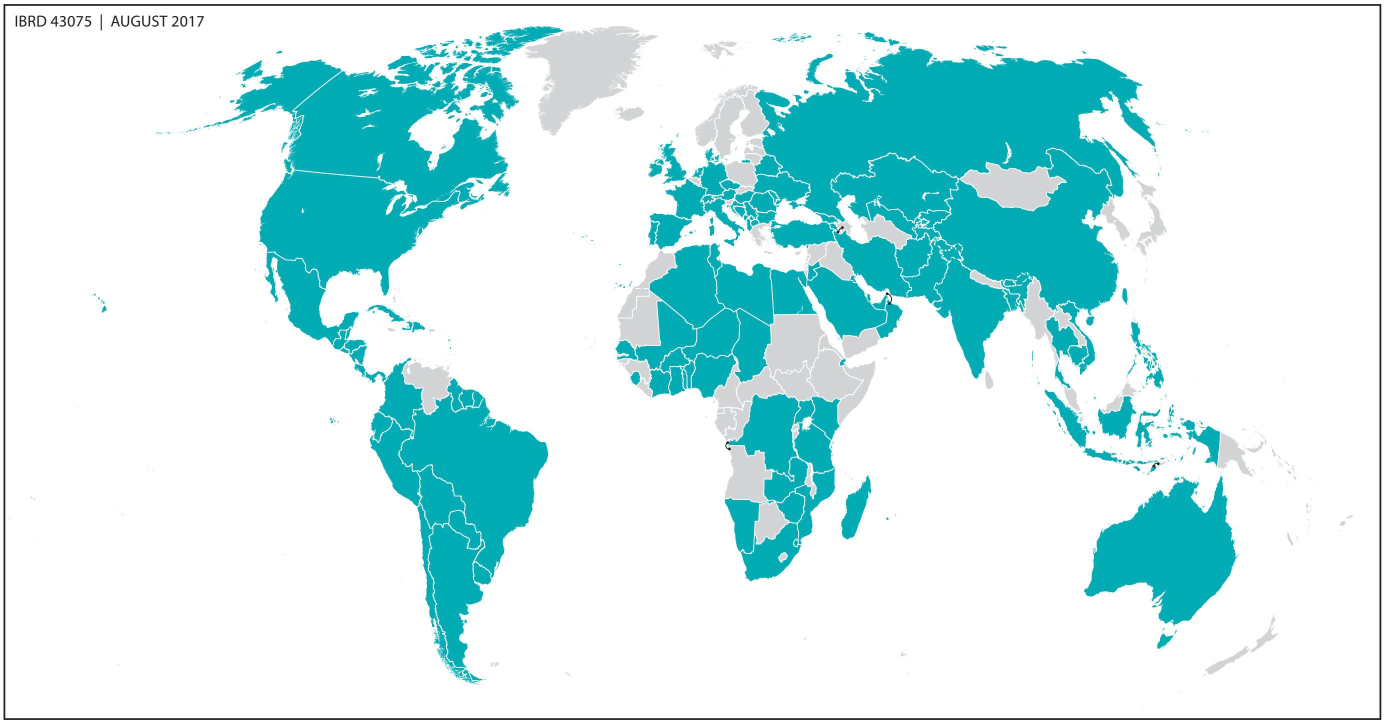
Region	No. of countries	Share of region (%)	Population covered (millions)	Share of region (%)
East Asia and Pacific	9	24	1,942	85
Europe and Central Asia	32	55	750	86
Latin America and the Caribbean	25	60	644	92
Middle East and North Africa	15	71	298	72
North America[a]	2	67	357	100
South Asia	6	75	1,741	98
Sub-Saharan Africa	22	46	690	74
Total	***111***	***51***	***6,422***	***88***

a. Excluding Mexico and Central America, as these are considered in the Latin America and Caribbean Region.

TABLE 3.2. Income-Level Representativeness of International Aggregation Trend Database

Income Group	No. of countries	Share of category (%)	Population covered (millions)	Share of category (%)
Low-income economies	16	52	429	66
Lower-middle-income economies	31	60	2,727	94
Upper-middle-income economies	34	61	2,423	93
High-income economies	30	38	843	72
Total	***111***	***51***	***6,422***	***88***

MAP 3.1. Countries for which Data Were Collected for the Global Trends Review



Territorial Divisions and Service Delivery Responsibility

The level of decentralization of WSS services increases in countries with higher levels of development and overall service coverage.

When contrasting the level of the jurisdiction in charge of service delivery against water coverage, the trend is clear (figure 3.1): The lower the water coverage, the higher the level of the jurisdiction in charge of service provision. For example, for 50 percent of countries that have water coverage of less than 25 percent, service delivery is a national responsibility. For 43 percent of countries that have water coverage ranging from 26 to 50 percent, service delivery is a regional responsibility. For 56 percent of countries with water coverage of more than 76 percent, service delivery is a municipal responsibility. In countries with greater coverage, and thus higher levels of water infrastructure development, service provision appears to be more decentralized.

A similar trend is observed when looking at the jurisdictional level that is responsible for service delivery and the level of gross domestic product (GDP) per capita (figure 3.2). Hence, for the 39 percent of countries where incomes are less than US$5,000 per capita, service delivery is a national responsibility. For the 52 percent of countries where incomes are more than US$20,000 per capita, service delivery is a municipal responsibility.

FIGURE 3.1. Level in Charge of Service Provision versus Water Coverage

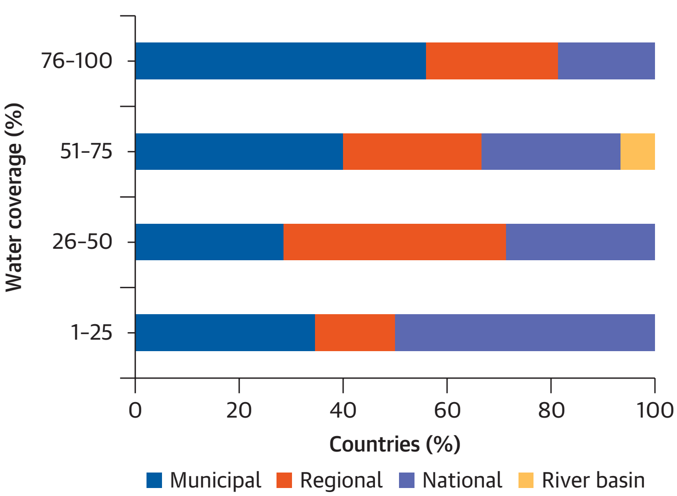


FIGURE 3.2. **Level in Charge of Service Provision, by GDP per Capita**

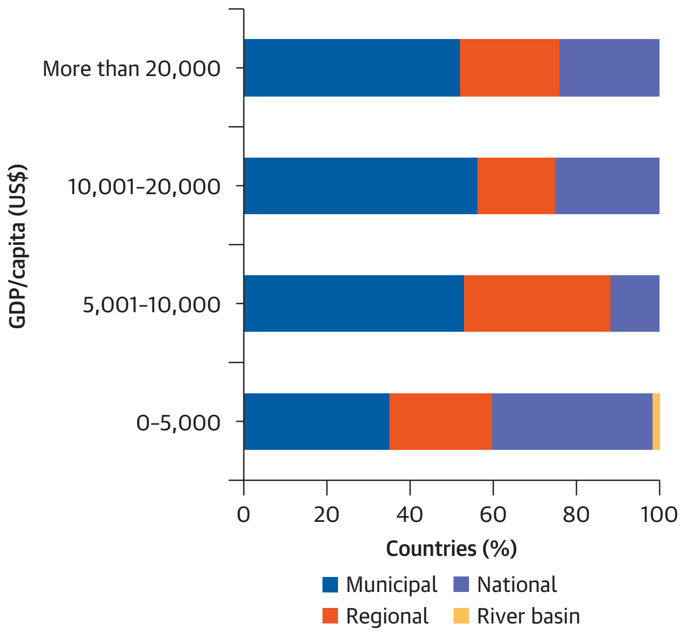
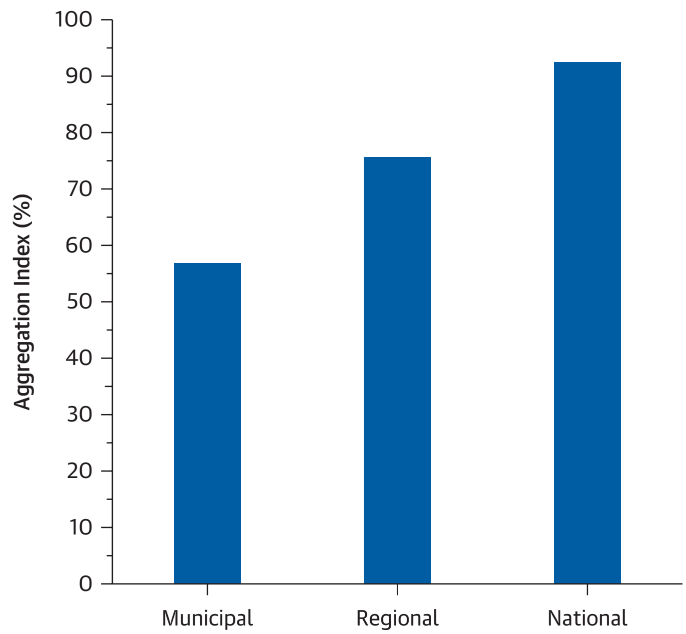


FIGURE 3.3. **Average Aggregation Index, Depending on the Jurisdiction Level Responsible for Water Service Provision**



Finally and unsurprisingly, countries that have decentralized service provision to regional and local levels have much lower aggregation indices (figure 3.3).

In countries where aggregation has happened (with or without a supporting legal framework), water sector fragmentation is lower than territorial fragmentation. On average, these countries exhibit an aggregation index of 77 percent, with a minimum of 15 percent for Colombia and a maximum of 100 percent for Algeria, Armenia, the Arab Republic of Egypt, and Niger (map 3.2). Unsurprisingly, the minimum number of utilities is encountered in countries where services have aggregated into one single national provider. The maximum number of water utilities is more than 34,000, in France, where aggregation reform is still in progress.

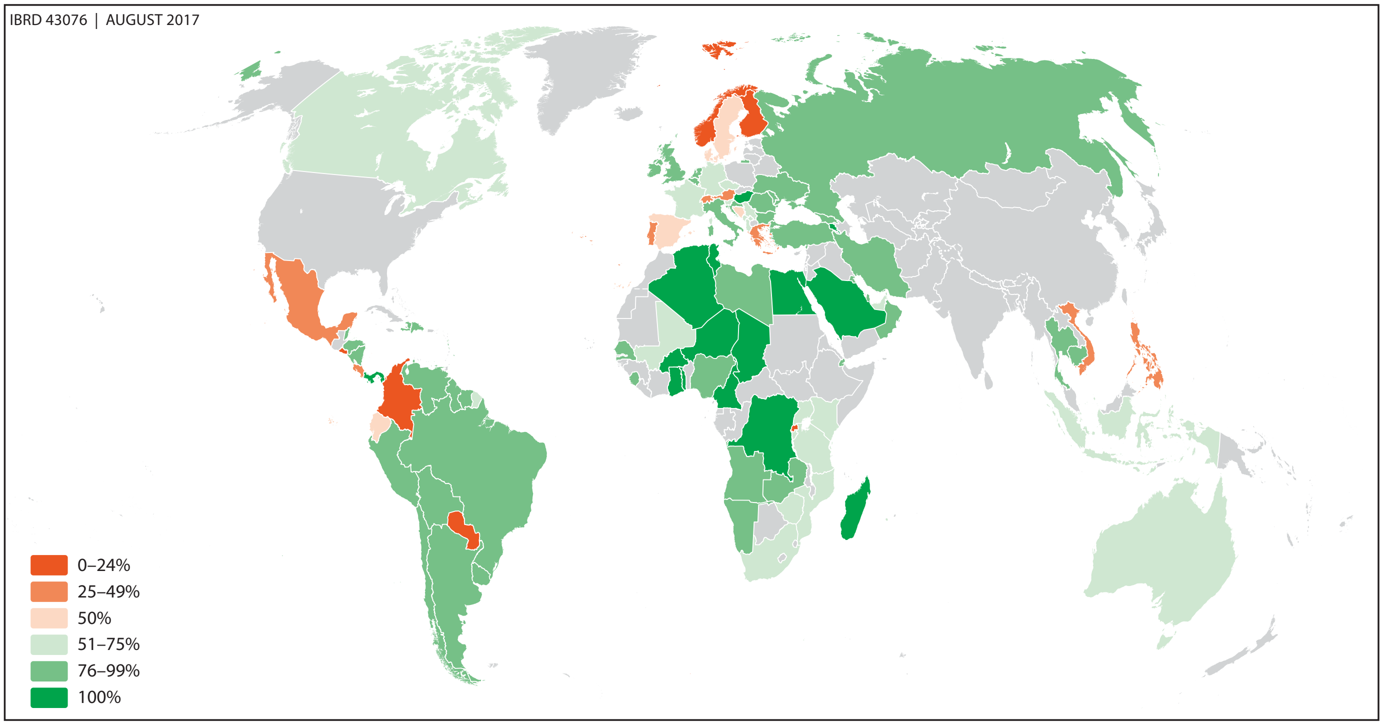
Where, When, and How Aggregations Happened

This section, unless mentioned otherwise, focuses on those countries in which aggregations have taken place, whether mandated (top-down), incentivized, or purely voluntary (bottom-up). Countries in which no aggregation reform is in place and where bottom-up cases of aggregation are not observed are excluded from the analysis.

Aggregation is a relatively recent trend, observed in African, European, and Latin American countries.

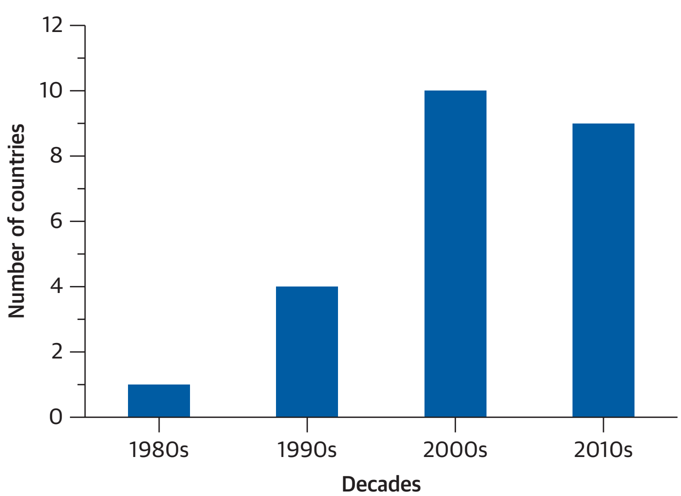
Among all countries in the global data set, aggregation happened in 35 (32 percent). In 23 countries (21 percent), aggregation was formalized through a reform that is either in place or in progress; 79 percent of these reforms were passed during the past 15 years (figure 3.4). As such, aggregation appears to be a relatively recent trend; only a few reforms were conducted before the end of the 20th century. Indeed, the decades before 2000 were characterized by a strong decentralization trend in the water sector.

MAP 3.2. Level of Aggregation of Service Providers



Note: Measured through the aggregation index; for the definition, refer to chapter 2.

FIGURE 3.4. Timing of Formal Aggregation Reforms



Aggregation is more predominant in countries where local governments are responsible for WSS service delivery.

Decentralization was perceived as a way to increase the autonomy and accountability of local governments, resulting in the transfer of competences from central governments to local elected authorities.

From a geographical perspective, 43 percent of aggregations are observed in European countries, whether from Western, Central, or Eastern Europe; 17 percent in Sub-Saharan African countries; and 14 percent in Latin America (map 3.3). Fewer aggregations are also observed in South and East Asia. When looking only at reforms in countries where a legal framework is supporting aggregation, 57 percent are happening in European countries and 24 percent in African countries (table 3.3).

In 47 percent of the countries analyzed in the data set, the municipal level of jurisdiction is responsible for WSS provision; in 24 percent, regions are in charge of WSS provision; in 28 percent, services are the responsibility of a national provider; and 1 percent fall under the responsibility of a river basin authority. However, when focusing only on the countries where aggregation has happened, these proportions change.

MAP 3.3. **Formal Policy or Legal Framework Supporting Aggregation**

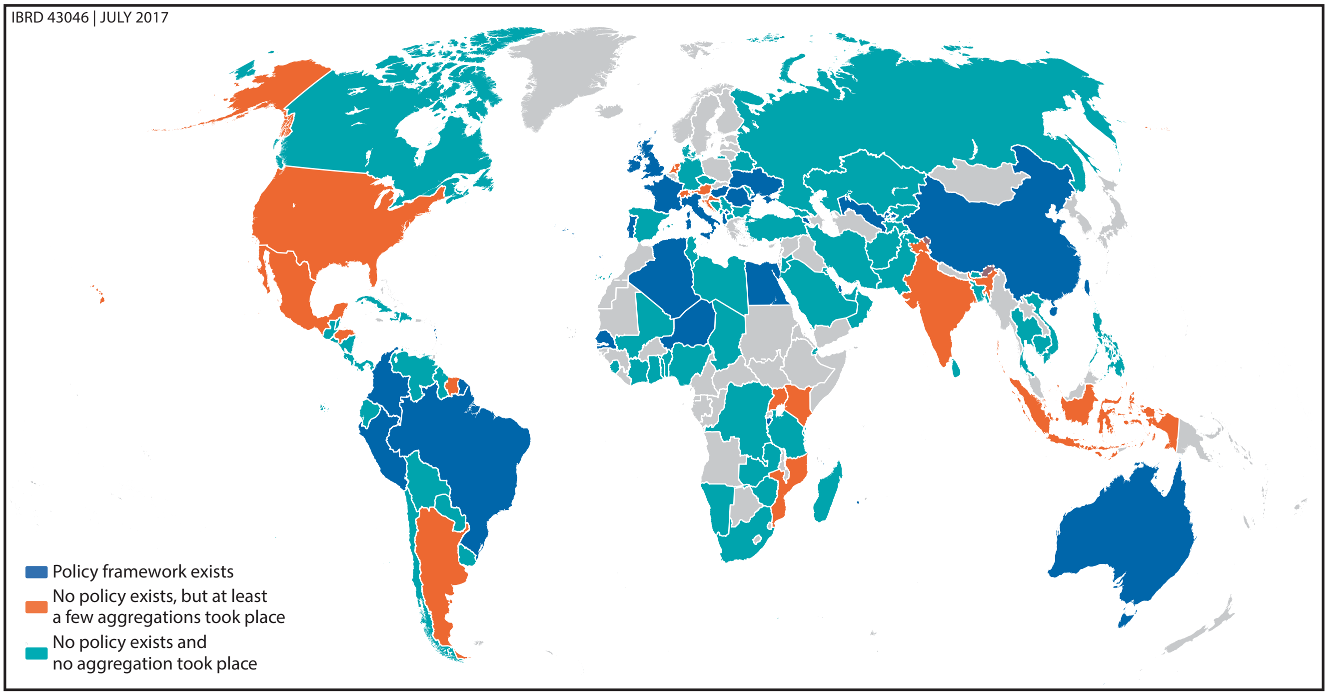


TABLE 3.3. **Countries with Formal Aggregation Reforms in Place and Aggregations Observed**

Region	Countries with formal aggregation framework		Countries with aggregations observed	
	Number	Share (%)	Number	Share (%)
East Asia and Pacific	2	9	3	9
Europe and Central Asia	13	57	15	43
Latin America and the Caribbean	3	13	5	14
Middle East and North Africa	3	13	4	11
North America[a]	0	0	1	3
South Asia	0	0	1	3
Sub-Saharan Africa	2	9	6	17
Total	***23***	***100***	***35***	***100***

a. Excluding Mexico and Central America as these are considered in the Latin America and the Caribbean Region.

The predominant aggregation type is a top-down, mandated process, targeted toward economic efficiency, encompassing all functions and services, following administrative boundaries, and taking the form of a merger.

In 29 percent of these countries, the municipal level is responsible; in 39 percent, the regional level, and in 34 percent the national level (figure 3.5). Aggregation logically appears to be more prevalent in those countries where local governments are formally responsible for service delivery.

Among the 111 countries in the data set, aggregations were observed in 35 (figure 3.6). In countries where aggregations happened, 60 percent of the processes were mandated. The remaining processes were voluntary (26 percent) or voluntary and incentivized (14 percent).

FIGURE 3.5. Level in Charge of Service Provision

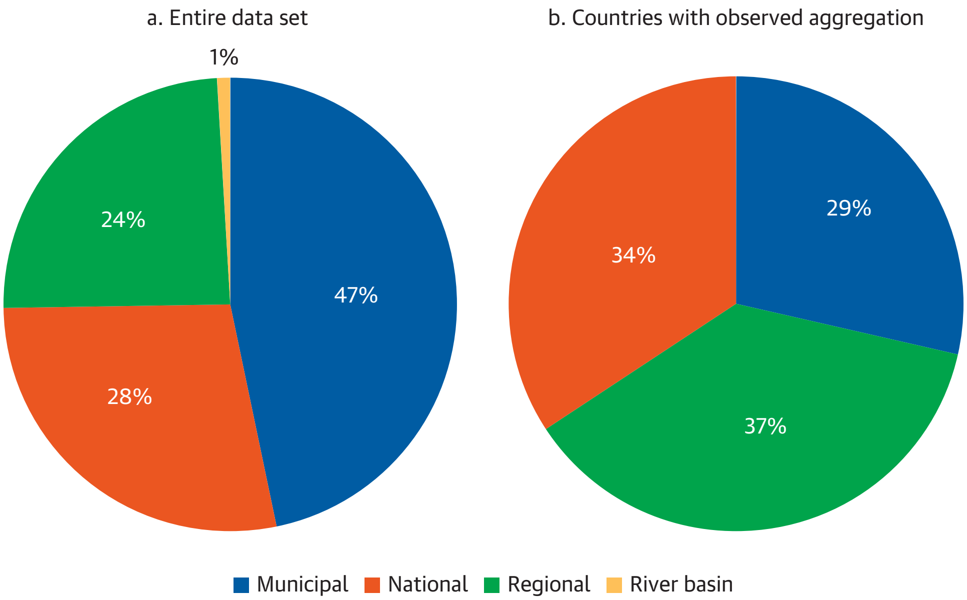
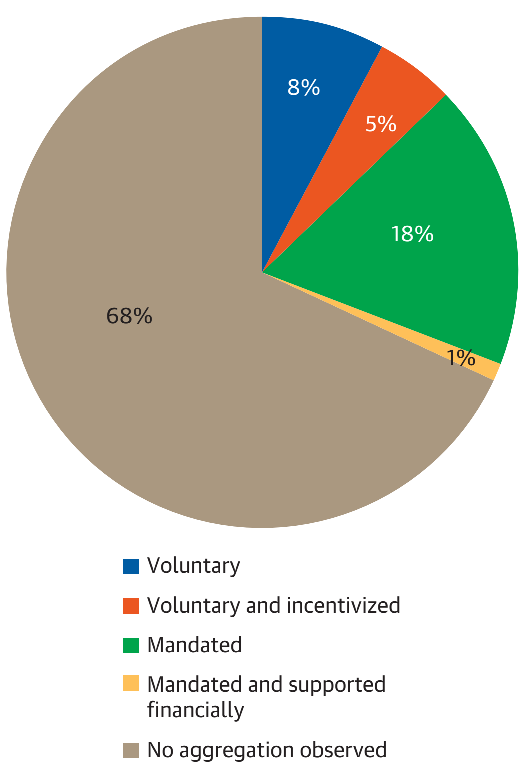


FIGURE 3.6. Aggregation Process, International Overview



Almost two-thirds of aggregations are implemented through a full merger of service providers (figure 3.7). This type of governance arrangement implies a stronger integration, which often translates into a principle of solidarity across the operating area through a harmonized water tariff and through cost and revenue sharing (see chapters 5 and 6). Delegated contracts (whether public-public or public-private) represent 24 percent of aggregation governance arrangements, whereas special-purpose vehicles are less frequent.

The scope of almost all aggregation processes covers both services and functions (86 percent), whereas the findings on the scale of aggregation are more nuanced. Some 56 percent of aggregation processes followed administrative boundaries, 33 percent had no predominant scale, and only 11 percent sought to match watershed limits (figure 3.8).

The predominant purpose of aggregation was to achieve better economic efficiency (46 percent); 20 percent aim at improving performance, 17 percent at enhancing professionalization, and 17 percent did not have a predominant purpose (figure 3.9).

Whether mandated (45 percent) or voluntary (50 percent), aggregation processes primarily aim at improving economic efficiency (figure 3.10). This is somewhat surprising, as one might have expected that voluntary processes largely aim at economic efficiency (internalities) while mandatory processes largely focus on externalities such as cost sharing or environmental benefits. However, this result is less surprising when bearing in mind that aggregations are more frequently observed in European countries with high coverage and good service quality.

FIGURE 3.7. Aggregation Governance, International Overview

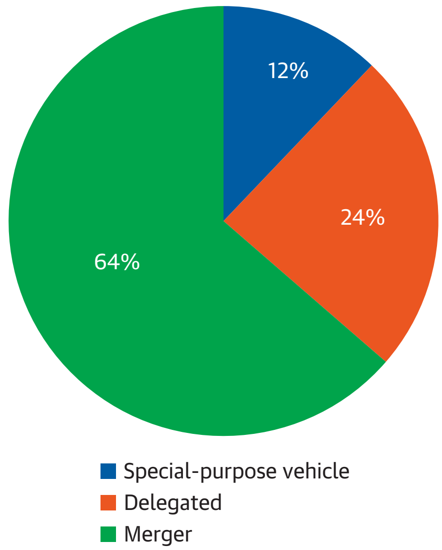


FIGURE 3.8. Scope and Scale of Aggregation, International Overview

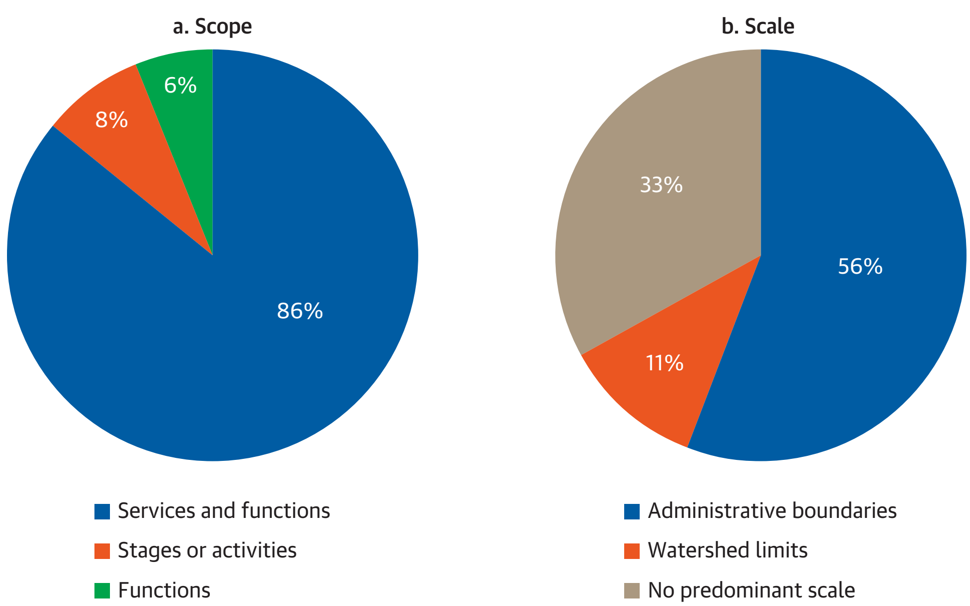


FIGURE 3.9. Purpose of Aggregation, International Overview

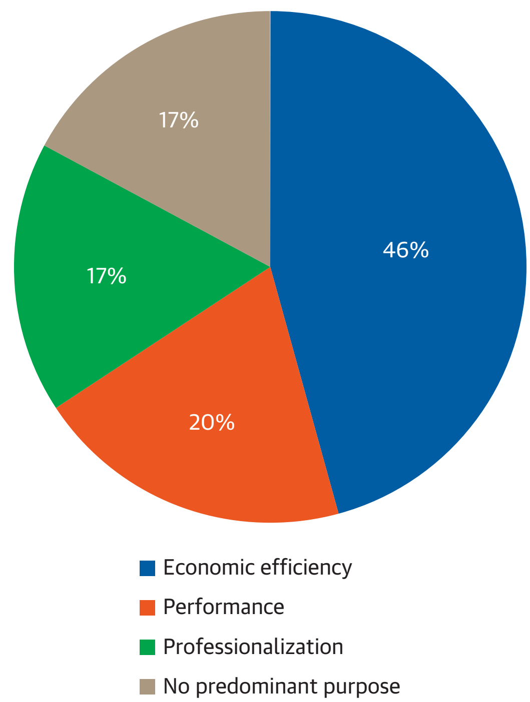
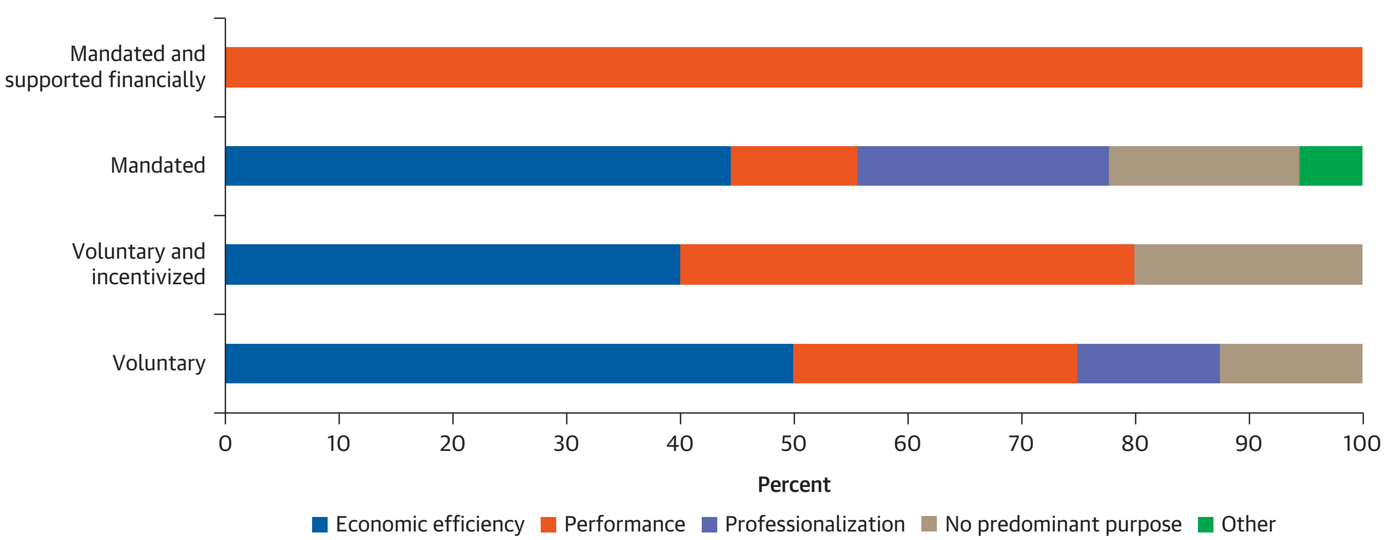


FIGURE 3.10. Types of Processes and Purposes, International Overview



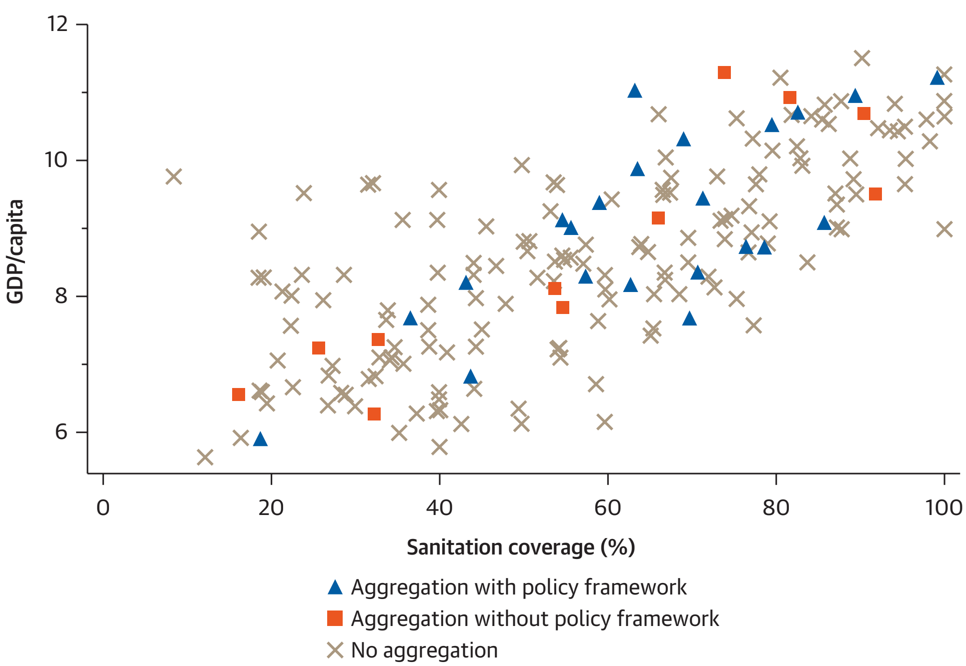
Relationships between Context, Purpose, and Aggregation Design

Aggregations are happening in a diversity of contexts but are more frequent in countries with high WSS services coverage.

Whether supported by a legal framework or not, aggregation is happening in countries of varying economic development levels and varying degrees of urbanization or fragmentation (figure 3.11).

There is a positive relationship between the probability of an aggregation reform and the extent of water infrastructure: aggregation reform is more common in countries where WSS coverage is high (figure 3.12). This is particularly true for aggregations that occur where there is a policy framework mandating or incentivizing aggregations (top-down process). Most aggregations with a policy framework are clustered in countries where coverage is high. Moreover, this finding is consistent with the fact that half of the aggregations happened in European countries that exhibit high levels of coverage.

FIGURE 3.11. Aggregation, by GDP per Capita and Share of Urban Population



Aggregations in countries with limited sector performance are predominantly aiming at improving services, whereas in countries where the coverage is high, economic efficiency is the main driver.

Economic efficiency is the purpose targeted by 65 percent of the countries where water coverage into premises is higher than 75 percent. As such, aggregation appears to be a means to lower costs for services that already have a good level of performance (figure 3.13).

Aggregations that aim at improving economic efficiency are more frequent in countries with higher GDP per capita, with higher shares of urban population, and with higher coverage levels (figures 3.14 and 3.15). This finding is consistent with the fact that half the aggregations happened in European countries that exhibit higher GDP levels, shares of urban population, and coverage levels. It also reflects the fact that in countries with low income and low coverage, aggregation focuses on priorities other than economic efficiency, such as expanding coverage or access to services, for instance.

Countries with smaller utilities and more fragmented water sectors pursue voluntary aggregations more frequently.

Regarding the process of aggregation, countries with smaller utilities on average (measured by population per utility) and more fragmented water sectors pursue voluntary aggregations more frequently. This is true for purely voluntary aggregations, but also for voluntary and incentivized aggregations (figure 3.16). Bottom-up processes are thus implemented as a

FIGURE 3.12. Aggregation, by WSS Coverage

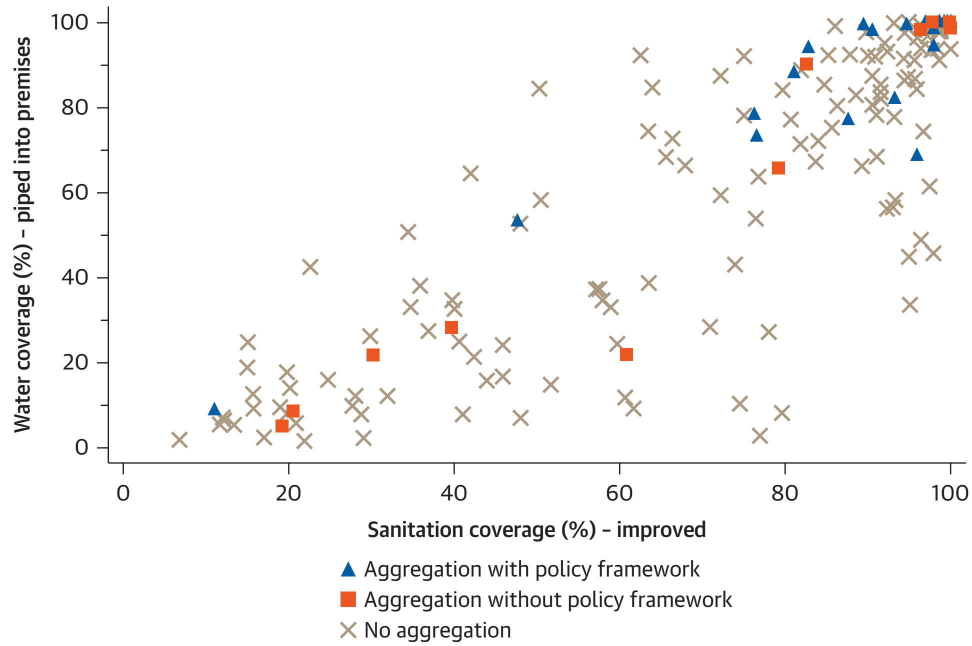


FIGURE 3.13. Purpose of Aggregation, Depending on Coverage

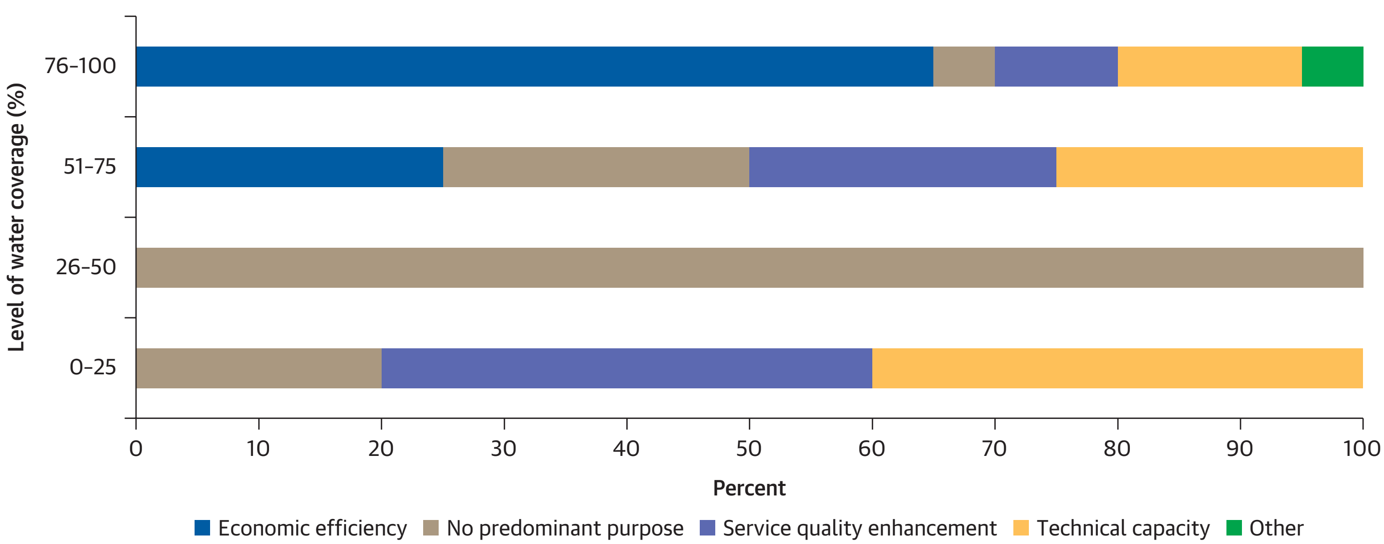


FIGURE 3.14. Purposes of Aggregation, by GDP per Capita and Urban Population

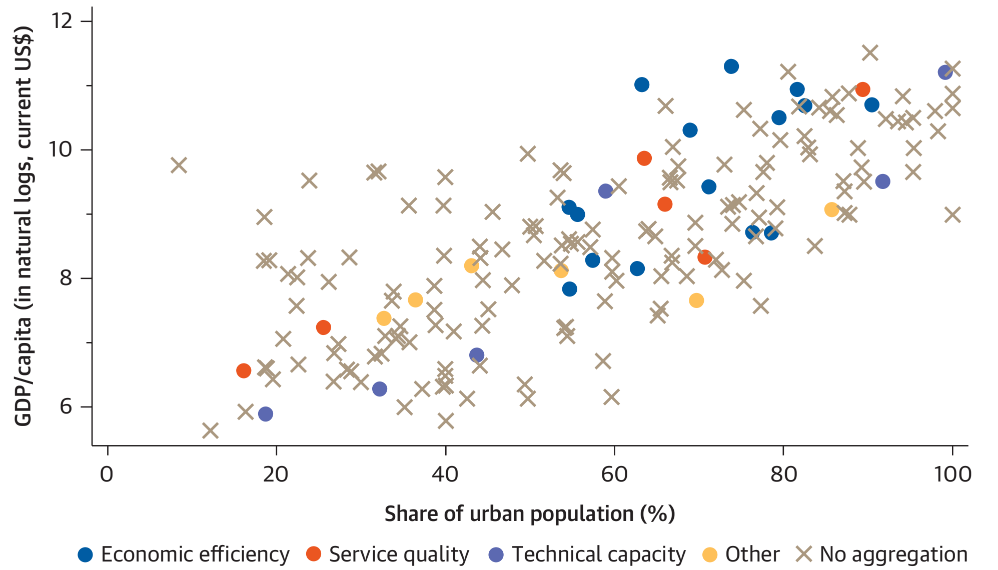


FIGURE 3.15. Purposes of Aggregation by Coverage

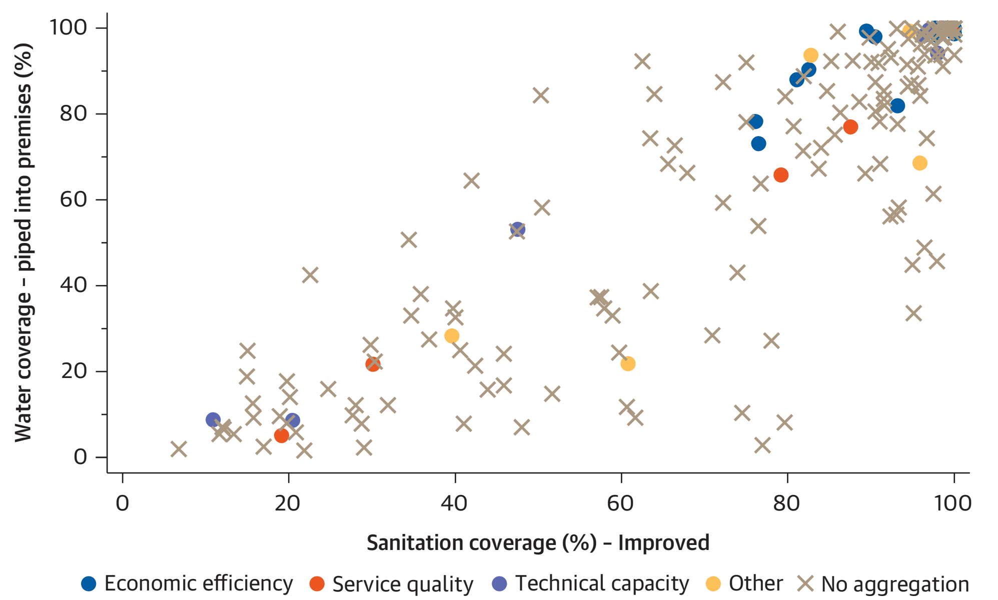


FIGURE 3.16. Median Utility Size and Aggregation Index in Countries, by Process of Aggregation

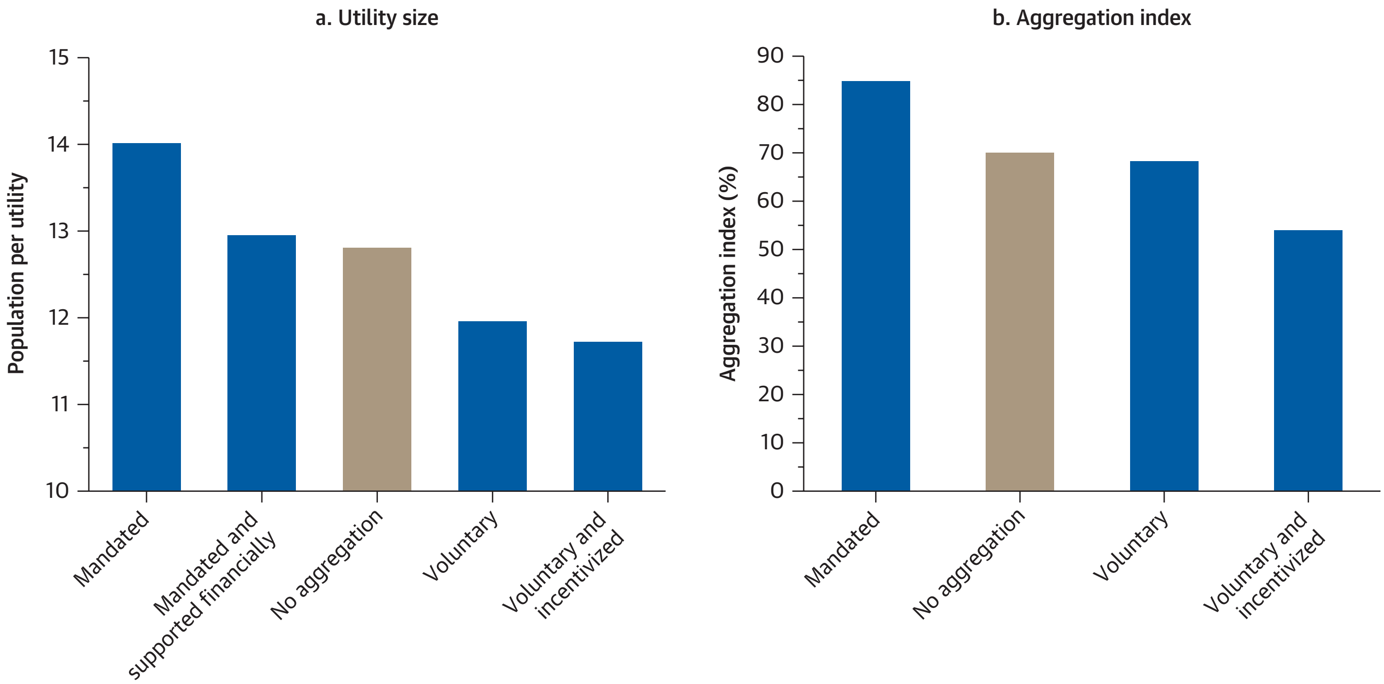
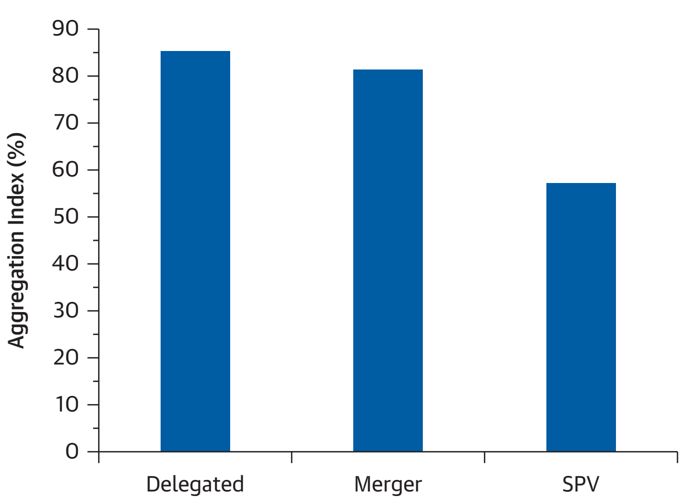


FIGURE 3.17. Governance Model Chosen, Depending on Indexation Level



Note: SPV = special purpose vehicle.

means to maintain or attain sustainability of service provision. In contrast, aggregations with mandated elements occur more frequently in countries whose utilities serve more people.

Interestingly, a special-purpose vehicle is also the governance model chosen in those countries that have highly atomized water sectors (low indexation index), as shown in figure 3.17. Highly atomized countries often correspond to federal states with largely decentralized service provision, which would then tend to select less constraining governance models, enabling them to optimize specifically those functions or services for which they see potential for economies of scale or scope.

Chapter 4

When Do They Work? The Quantitative Evidence

This section presents the empirical evidence from a quantitative analysis of the full IB-Net data set, consisting of an identification of aggregation cases occurring within the data set and a comparison of the performance of those aggregated utility companies with similar, non-aggregated utility companies. The analysis presented in this report focuses on the most robust and relevant results; a much more extensive supporting paper with detailed results and robustness analysis is available in the toolkit.

Although IB-Net covers several thousand utilities all over the globe, the number of aggregations[1] in the database is substantially lower. After cleaning the data and restricting the analysis to utilities suitable for an evaluation, 79 aggregation cases remained. Most of those cases occurred in Europe or Central Asia (table 4.1). Although IB-Net is not representative in terms of country coverage, the database suggests that most of the aggregation reforms occurred in Central and Eastern Europe, and to some extent in South America and Central Asia, which is consistent with the findings of chapter 3. Virtually all aggregations occurred between 2000 and 2010, with a scant few before and after these dates.[2]

In the IB-Net data set, the following countries had the most aggregation cases: Romania (15), Poland (12), Hungary (6), Kazakhstan (7), Serbia (5), the former Yugoslav Republic of Macedonia (4), and the Czech Republic (4). It should be noted, however, that although the bulk of the cases is located in these 7 countries, cases of aggregations from 25 countries fed into the analysis.

Related to the country distribution, most aggregations occur in upper-middle-income and high-income countries (table 4.2). There are also some cases in lower-middle-income countries, but none from low-income countries.

The quantitative analysis is limited to the data and information available in IB-Net and therefore focuses on the outcome of aggregation processes in terms of economic efficiency and performance improvements; owing to data limitations, the impacts on externalities such as solidarity and the environment are therefore excluded. Likewise, the data set does not allow an in-depth investigation of the influence of

TABLE 4.1. Distribution of Aggregations in IB-Net, by Region

Region	Number of aggregation cases	Countries with aggregations observed
East Asia and Pacific	3	3
Europe and Central Asia	69	17
Latin America and Caribbean	5	3
Middle East and North Africa	1	1
Sub-Saharan Africa	1	1
Total	**79**	**25**

TABLE 4.2. Distribution of Aggregations in IB-Net, by Income Level of Countries

Income Group	Number of aggregation cases
High income	27
Upper middle income	43
Lower middle income	9
Total	**79**

Note: Income levels as defined in the World Development Indicators.

BOX 4.1. Utility Performance and Water Utility Performance Index

Consideration of multiple performance measures is important in light of the various purposes an aggregation can pursue (see chapter 2). Apart from performance on the input side, which this report measures as unit cost, performance can also be measured on the output or outcome side. To this end, this study uses the Water Utility Performance Index (WUPI)—developed in a study for water utilities in the Danube region—and its subcomponents. Starting from 10 key performance indicators, the study constructed 3 distinct outcome indicators:

- **Coverage** is basically an indicator of the share of population connected to water and wastewater services, and the extent of wastewater treatment. Higher values indicate a higher share of population connected and a higher extent of wastewater treatment.
- **Quality of service** represents the performance of a utility in terms of the number of hours of service as well as the frequency of sewerage blockages. Higher values indicate more hours of service and fewer blockages.
- **Management efficiency** seeks to measure managerial efficiency. It is based on a number of subindicators such as staffing efficiency, cost recovery, share of metered connections, revenue collection, and non-revenue water. Higher values indicate higher cost recovery and recovery collection, more metered connections, lower staffing, and lower non-revenue water.

The details of the calculations of WUPI, such as the measurement of the subindicators used, appear in appendix B.

utility governance or aggregation process design on overall outcome. Those issues are investigated in detail in chapter 5, on the basis of qualitative case studies. Here the focus is on a general appraisal of whether aggregations generated the expected cost savings or performance improvements.

For utility performance, this chapter uses a set of quantitative indicators to capture the various purposes of aggregations. Most important are coverage, quality of service, and management efficiency. In addition, these subindicators are used as an aggregate in the form of a composite performance indicator (WUPI) (box 4.1). It should again be noted, however, that although these indicators capture some important aggregation purposes, goals in other dimensions are beyond the analysis of this chapter.

A key insight is that aggregations are not only a story of economies of scale. Although the data confirm that large utilities tend to have lower unit costs and better performance than small utilities, whether improvements materialize during an aggregation process depends on the aggregation design. Moreover, many of the aggregation cases in IB-Net exhibit features—for example, an increasing rather than decreasing share of labor costs—that are detrimental to performance improvements. Bearing in mind the trade-off between production and transaction costs outlined in chapter 2, such a finding is hardly a surprise and is consistent with earlier literature (see chapter 2). This chapter shows that aggregation success should not be taken for granted and that the process should be designed bearing in mind the participating utilities' starting point and intended purpose.

Bigger is Generally Better…

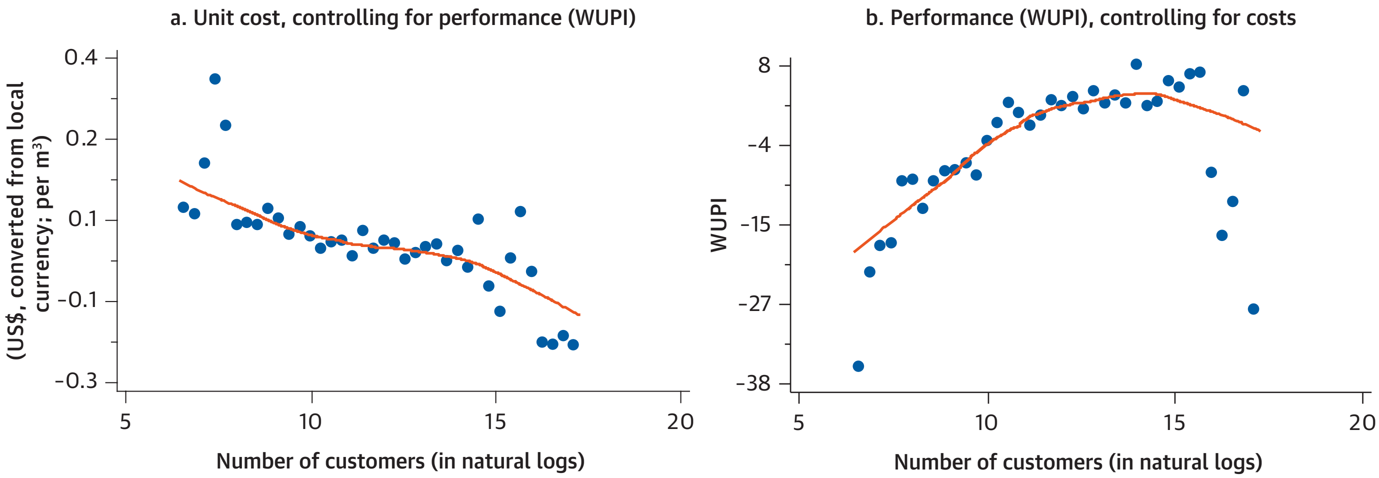
Utilities that distribute a larger volume of water have, on average, lower unit costs than utilities that produce a smaller volume. This empirical relationship appears to hold in water industries around the globe and is one of the main arguments in favor of utility aggregations. The expectation of unit and common cost savings from utility mergers has been supported by a large number of economic studies since the late 1960s, arguing that the water sector is characterized by important economies of scale (box 4.2). Unit cost should fall with increasing output over substantial parts of the output range.

In recent years, a number of survey articles have tried to take stock of what is known from associated research (see González-Gómez and Garcia-Rubio 2008; Abbot and Cohen 2009; Walter 2009; Ferro, Lentini and Mercardier 2011; Carvalho, Cunha Marques and Berg 2012; and Saal and al. 2013). This study's reading of these surveys is that the industry has important economies of scale that are nonetheless not unlimited. The evidence appears to be particularly strong in the case of small companies and medium-sized companies, and much less so for large companies. The United Kingdom is given as an example where excessive size might have had negative effects on productivity (González-Gómez and Garcia-Rubio 2008). All six reviews share the view that economies of scale decrease with increasing utility size and eventually turn into diseconomies of scale. The studies also note that the estimated optimal

BOX 4.2. Definition of Economies of Scale

Economies of scale exist if long-run unit costs decrease with output increases. Applied to the water sector, this means that the cost per cubic meter of water decreases while water production increases. Empirical studies on the WSS industry note that economies of scale are prevalent in small providers, while diseconomies of scale start appearing in very big ones.

FIGURE 4.1. Unit cost and Performance, Depending on Size



utility size appears to vary strongly within and across countries (Saal et al. 2013). Abbott and Cohen (2009) note that the optimal number of connections varies from 100,000 in Fraquelli and Giandrone (2003) to 766,000 in Mizutani and Urakami (2001) and to one million in Fraquelli and Moiso (2005). Walter et al. (2009) reach a similar conclusion for output level per cubic meter of water. Consequently, the surveys tend to conclude that consolidations are beneficial, at least for moderately large utilities. González-Gómez and García-Rubio (2008) give a nuanced account of the existence of economies of scale by also stressing the role of the overall production environment. According to them, the relevance of customer density and regional dispersion is illustrated in a number of studies. Small-density mergers and large geographical service areas might reduce the profitability of a consolidation considerably.

Also in the utility data analyzed in IB-Net, it can be shown that larger utilities have lower unit costs and higher performance than smaller utilities. As shown in the left panel of figure 4.1, with increasing size, as measured by the number of customers, the unit cost curve clearly slopes downward. Similarly, the right panel of figure 4.1 suggests that utilities with more customers exhibit better performance, at least up to a certain level. These relationships do not, however, imply that merging utilities universally results in lower unit costs and better performance, as discussed in the next section.

But with Increasing Size and Number of Towns, Transaction Costs Emerge…

The possibility of cost savings arising from economies of scale has encouraged policy makers around the world to embark on utility aggregation reforms, by either incentivizing or imposing the aggregation of service providers. Consistent with the theoretical discussion in chapter 2, our analysis of actual utility aggregations using IB-Net data show that in some cases the reforms have led to both improved financial sustainability and performance, whereas in other cases the benefits did not materialize. Several factors can explain this result.

Utilities serving several towns do not see a straightforward decrease in unit costs when their size increases.

As discussed previously, for utilities that serve a single town, the typical economies of scale relationship holds: unit costs tend to decrease with greater numbers of customers (see figure 4.1). Although the steepness of the relationship varies, this result is found consistently across almost all countries.

In contrast, the cost-to-output relationship is more complicated and sometimes even increases for utilities that serve more than one town (figure 4.2, contrasted with figure 4.1). The cost-customer relationship is not only flatter but also exhibits a larger variation than for utilities that serve a single town. The possible cost savings of increasing the number of customers in aggregated utilities, that is, those with more than one town to serve, are therefore uncertain and more limited than those of a single municipality that grows its customer base. Similar results can be found for performance in utilities serving several towns. Although larger utilities still tend to exhibit higher performance, the line is again flatter and exhibits larger variation.

Furthermore, the argument that aggregations differ from simple economies of scale can be emphasized by looking at the relationship between unit cost and the number of towns served. The left panel of figure 4.3 shows that when customers are controlled for, unit costs increase as the number of systems served increases, clearly demonstrating the impact of the transaction costs described in chapter 2. At the same time, the right panel of the same figure shows that performance does improve, confirming that aggregation can be a meaningful instrument to improve the performance of utilities. Although the origin of the cost disadvantage and performance improvement for utilities serving several towns cannot be identified in the data, the figure demonstrates that managing several towns has to be distinguished from managing more or fewer customers. Consequently, whether a given aggregation process ultimately yields a performance improvement or unit cost reduction or not also depends on how the aggregation changes the fraction of customers per town. As past aggregation studies have shown, adding few customers and many towns tends to curb cost savings.

FIGURE 4.2. Unit Cost and Performance for Utilities Serving more than One Town, Depending On Size

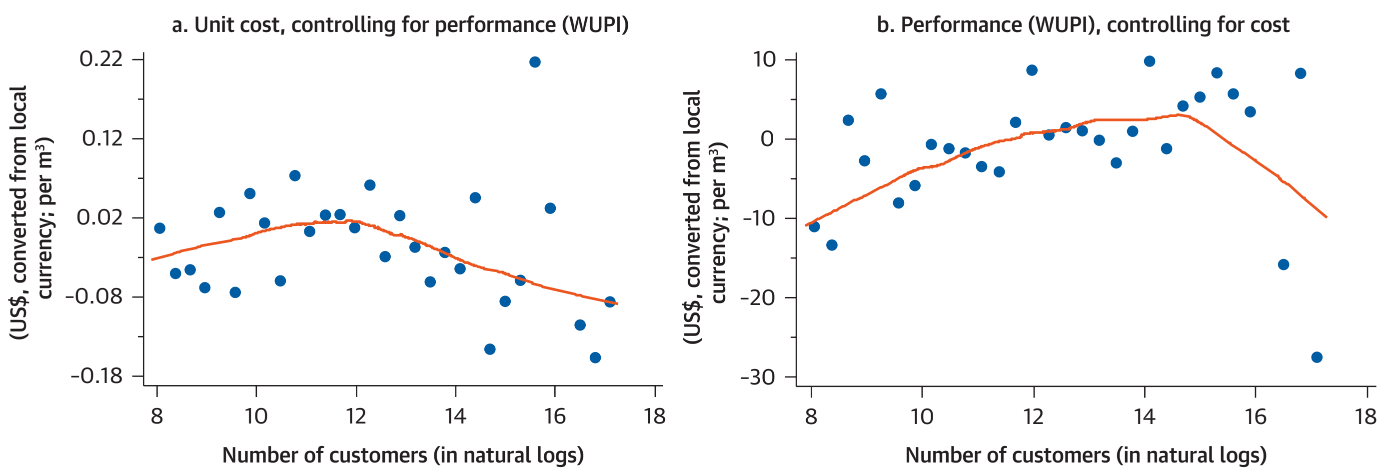
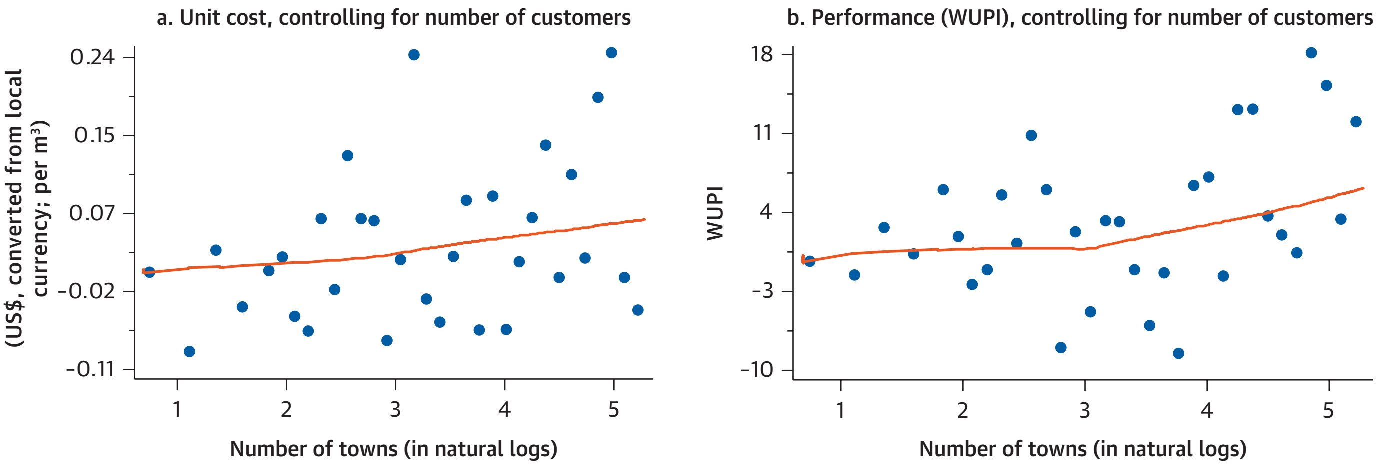


FIGURE 4.3. Unit Cost and Performance, Depending on Number of Towns Served and Controlling for Customers



Note: Owing to the different shapes of the cost curves, a dummy for Brazil was added, in the regression controlling for the number of customers.

Most aggregations involve larger, urban utility companies taking over smaller, more rural towns, and therefore tend to add few customers and decrease density.

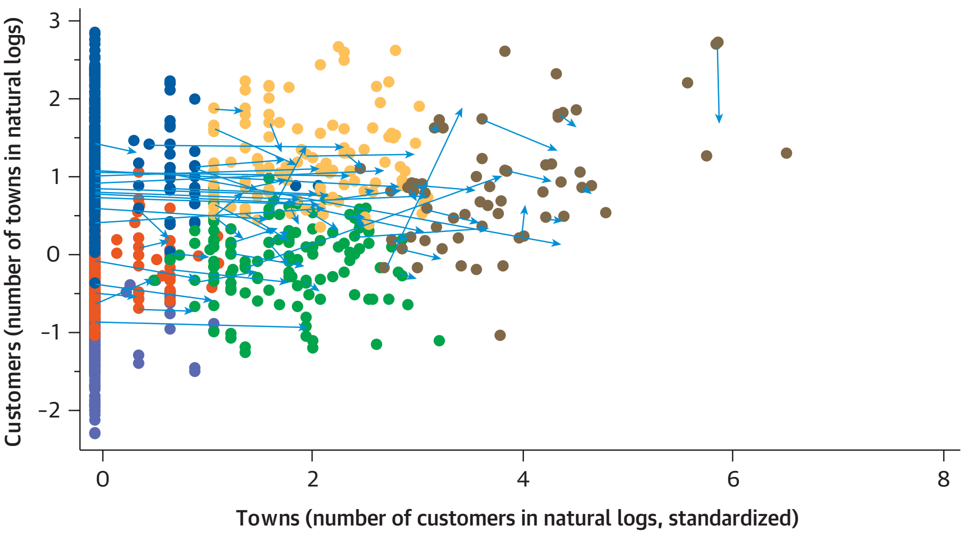
Utilities serving multiple towns face a more uncertain evolution of cost as customers are added. Thus, the analyzed aggregations observed in IB-Net are unlikely to yield cost savings simply because they add relatively few additional customers. As shown in figure 4.4, aggregations tend to add a large number of small towns with only a limited increase in overall population. As the many horizontal arrows in the graph indicate, the change in the number of customers is very limited. This indicates that most of the aggregations in the IB-Net data set represent large utility companies taking over smaller ones. To achieve cost savings through economies of scale, utilities would have to move along the downward-sloping cost function, as shown in figure 4.1, which would imply a more vertical movement of utilities in figure 4.4. This is clearly rather the exception than the rule: the aggregations have added only a few customers.

Most aggregations observed in IB-Net also decrease utility network density, which is measured as the number of customers by kilometer of water and sewerage network. As figure 4.5 shows, the length of the network increases at a faster pace than the number of customers, leading to a decrease in density in most aggregations. This is consistent with the previous finding of aggregations consisting mostly of larger, dense urban utilities taking over more dispersed, small utilities. This finding is consistent with a number of previous studies suggesting that density losses prohibit economies of scale (box 4.3).

Utilities going through aggregation do not see decreases in the cost of labor, a key expenditure and expected area of economies of scale.

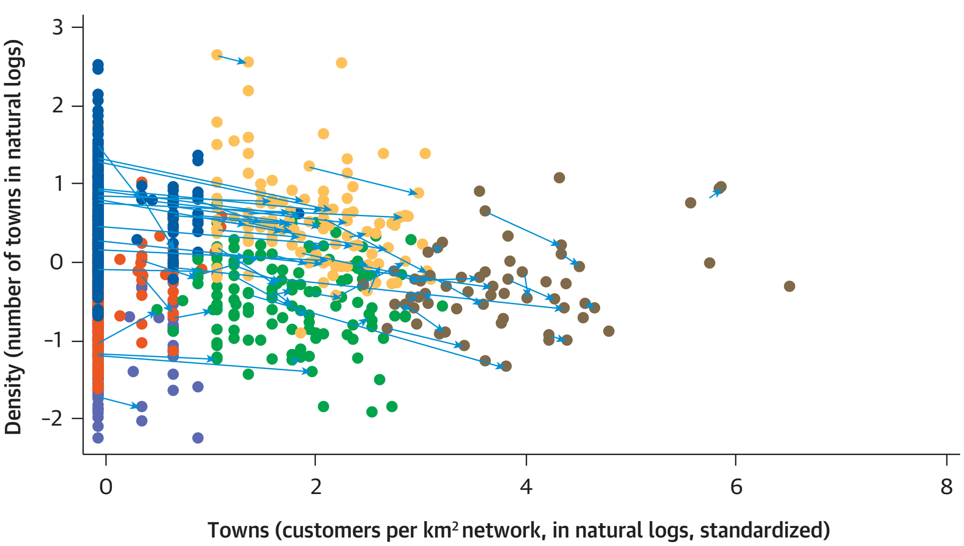
Another issue that calls into question the potential cost savings through aggregation is the evolution of the cost structure. One of the main differences between smaller and larger utilities is the share of labor costs, with the latter having lower costs on average. Although wages tend to be higher in larger utilities, the labor cost per customer is considerably lower. This suggests that some of the cost advantage from larger utilities is due to lower labor unit costs, especially a smaller number of employees per connection (for more details, see box 4.4).

FIGURE 4.4. Change of Number of Towns and Number of Customers Served Due to Aggregations



Note: The arrows indicate the changes in the number of towns served and network density. The colors of the utilities signify homogenous groups of utilities with similar structure (volume, density, towns).

FIGURE 4.5. Change of Number of Towns Served and Network Density Due to Aggregations



Note: The arrows indicate the changes in the number of towns served and network density. The colors of the utilities signify homogenous groups of utilities with similar structure (volume, density, towns).

However, in the analyzed aggregations, the data do not suggest any reduction in the labor share for aggregating utilities, even several years after the aggregation process. Figure 4.6 shows the evolution of the labor share from five years before the aggregation to five years after the aggregation in a local, linear, smooth plot: The figure shows that labor cost shares do not seem to decrease—rather the contrary. This finding is also consistent with some of the case studies, where an upward wage harmonization occurred or where the aggregated utility was forced to take on the staff of the previous utilities.

Labor cost appears to play a key role in this setting, not only because it is frequently the largest single cost component, but also because it is the only cost component that appears to exhibit downward rigidity. Similar to the macroeconomic phenomenon that wages rarely decrease in nominal terms, utility labor costs do not seem to decrease even after aggregations (figure 4.7). All cost components increase before aggregation, possibly caused by some short-run transaction cost of the aggregation reform or input price increases above average inflation. However, energy and other costs come to a halt and even decrease after the aggregations, while labor costs continue to increase. Although this is no causal analysis, it points to the critical role of labor cost in achieving cost savings through aggregation reform.

BOX 4.3. Empirical Evidence From High-Income Countries: Aggregations in the Netherlands and Japan

Among the few quantitative studies of water utility aggregation that analyze utility performance before and after such reforms are De Witte and Dijkgraaf (2010) for the Netherlands and Urakami and Parker (2011) for Japan. In contrast to many static comparisons of large and small utilities, the conclusions from these two aggregation studies are much less favorable toward utility mergers.

The first study is an ex post evaluation of the benchmarking system introduced and the utility consolidations that occurred after 1997 in the Netherlands. The Dutch case is interesting, as the sector was already highly concentrated before the reforms: the sample period from 1992 to 2007 saw a further decrease in the number of utilities, from 20 to 10. Water utilities had an average production of 69 million cubic meters (m^3). As a result of the aggregations, this amount increased to 111 million m^3 on average. De Witte and Dijkgraaf's appraisal of the reforms is ambiguous. The overall results were very mixed, depending on the methodology, but no estimation showed a positive and significant effect on scale efficiency. In a few cases, they even found higher average costs after the aggregations. Similar to the study of the United Kingdom (Saal, Parker, and Weyman-Jones 2007), this paper questions the benefits of mergers in sectors where the utilities are already large.

The consolidation study by Urakami and Parker differs from the previous one in several respects. First, it has a large sample of several hundreds of aggregating utilities. The sample covers Japanese water utilities from 1999 to 2006, which saw a large-scale aggregation from 1,958 to 1,602 units. Second, in Japan—unlike in the United Kingdom or the Netherlands—water supply is much more fragmented with a large number of utilities of varying size. It might therefore give a broader account of aggregation effects, considering also small-scale units. Their findings suggest that aggregations did indeed reduce utility costs. Although the effect is statistically significant, it is very small, with aggregated utilities being 1.8 percent more productive. Regarding economies of scale, the study finds that on average, both aggregated and non-aggregated utilities are still operating at economies of scale. The authors conclude that benefits from aggregation may not have materialized more clearly because at least some of the mergers involved rural utilities with low density.

These two studies show that the context and design of aggregation may matter a lot, similar to the argument made in chapter 2. Two dimensions appear critical. A utility may already be too large, and its operation may be characterized by diseconomies of scale. The Dutch case stressed this fact. Regardless of initial size, the Japanese case illustrated that aggregations may be detrimental to cost efficiency if they absorb low-density systems. Particularly large urban utilities might lose economies of density through such mergers.

BOX 4.4. Structure of Operational Expenditure for Small, Medium, and Large Utility Companies

To understand the cost differences between small and large utilities—and therefore als the source of possible efficiency gains through mergers—it is clear that differences in cost structure may play an important role. To analyze this relationship, the left panel of figure B4.1.1 displays the costs shares for (i) labor, (ii) energy, and (iii) other cost for utilities of small (<2.4 million m^3), medium (>2.4 million m^3 and <13 million m^3), and large (>13 million m^3) size as measured by volume. Despite the considerable variation in each group—for example, each group contains utilities that have very high as well as very low labor cost shares—a few striking patterns emerge.

Cost shares and absolute costs spent on labor decrease from small to medium utilities and further to large utilities. Larger utilities spend a lower proportion on labor. A similar pattern applies for energy costs, which also decrease when moving from small to medium to large utilities. The converse holds for other costs (for example, consulting costs or costs of various procured goods), which tend to increase in both relative and absolute terms with increasing utility size.

The hypothesis that larger utilities spend less on labor and energy not only as a share of expenses but also in absolute values is confirmed by the right panel in figure B4.1.1, where moving from small to medium and large utilities, it is clear that the cost of labor and the cost of energy per cubic meter are falling. In contrast to labor and energy, the component for "other cost," as shown in the right panel of figure B4.1.1, does not appear to decrease with volume (cubic meters). If anything, the clusters with larger and denser utilities exhibit higher costs per cubic meter.

Taken together, the results suggest that growth in utility size is related to lower labor cost and lower energy cost—both in cost shares and in absolute terms. For other cost components, rather the opposite relation seems to apply. Economies of scale, if any, therefore seem to originate from labor and energy costs, whereas other costs might even increase with volume and density.

FIGURE B4.1.1. Median Cost Shares and per m^3 Cost for Labor, Energy, and Other Costs

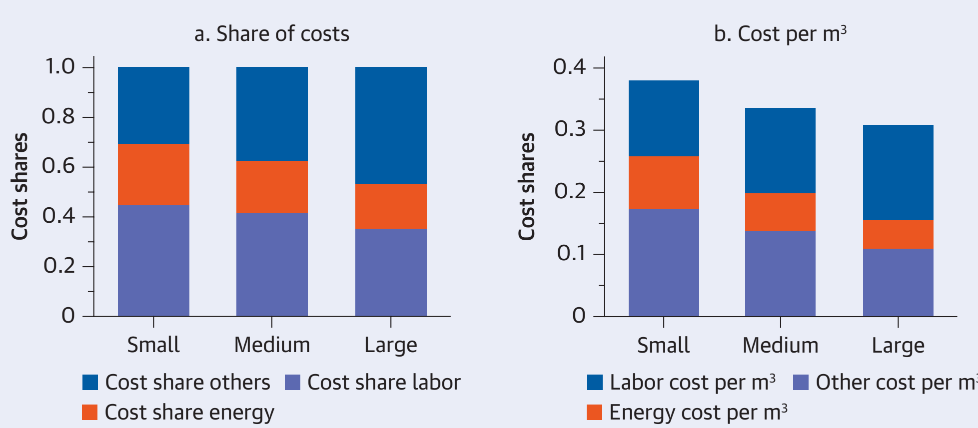
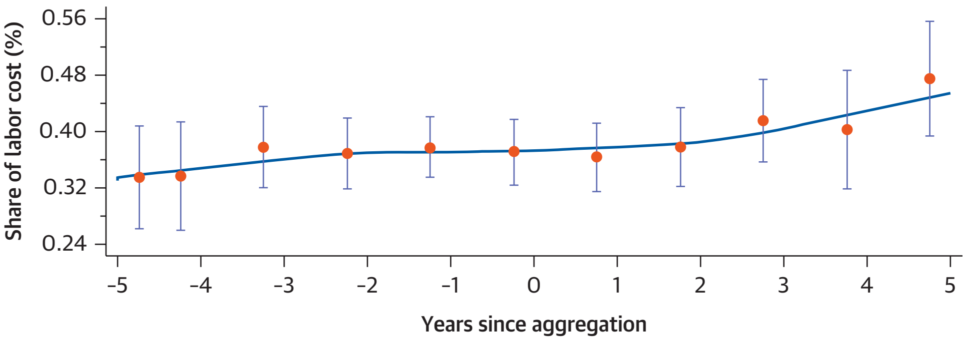


FIGURE 4.6. Labor Share of Cost Before and After Aggregations

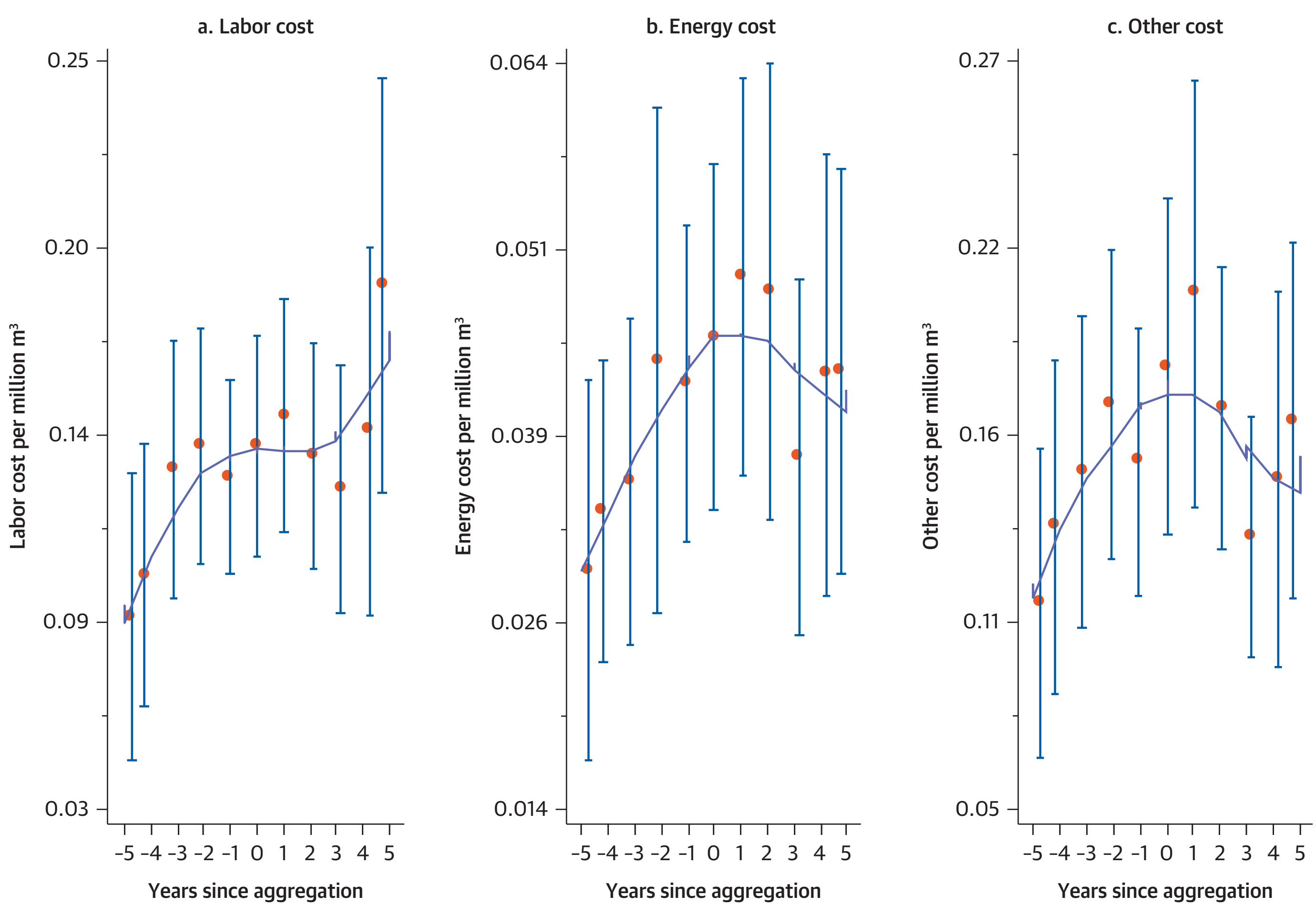


Note: Negative values indicate years before the aggregation.

And Specific Outcomes Depend on the Context and Purpose of Aggregation

The empirical analysis of IB-Net data show that the effect of aggregations varies widely and does not automatically decrease cost or improve performance. These results are based on before-and-after comparisons of utilities that aggregated with similar utilities

FIGURE 4.7. Cost Components Before and After Aggregations



Note: The cost components have been deflated using the World Development Indicators consumer price indices and then converted to U.S. dollars. Negative values indicate years before the aggregation.

that did not. Looking specifically at the postaggregation period, there is some evidence that managerial efficiency tends to improve through aggregation. This finding closely corresponds to the reported professionalization that is present in many case studies.

There are two potential explanations for the apparently very limited systematic results. First, aggregations have widely varying purposes. This leads to different processes and aggregation designs, resulting in very different outcomes. Second, some aggregations were more successful than others because the initial context and designs were very different. Additional statistical tests show that some utility types might benefit more than others and that the design of the aggregation matters.[3]

Limited, less complex aggregations, and aggregations of utilities that are already serving multiple towns, are more likely to achieve cost savings.

Regarding the physical context before the process, aggregations that add only a small number of towns seem to be able to achieve cost savings compared with aggregations that involve a large number of towns, such as large-scale regionalization schemes. This finding could suggest that organizational complexity and transaction costs are limited in aggregations involving only a few towns and do not outweigh the economies of scale achieved through the aggregation. Conversely, merging a large number of previously independent utilities in a single step seems more challenging and prevents performance improvements and cost savings.

In the IB-Net data set, such low complexity, cost-effective aggregations are very dispersed across countries and time. This might be because those aggregations occur voluntarily, in a bottom-up fashion, rather than through a countrywide aggregation strategy. Although this finding is not evidence against large-scale regionalization, cost savings are more likely in small-scale ones.

The other type of utility that seems able to achieve cost savings through aggregations are those that are already serving a large number of towns before the aggregation process starts. Conversely, utilities that previously served a single municipality do not reduce unit costs when adding towns to serve. This complements the findings in Klien and Michaud (2016) showing that (large) utilities serving a single municipality are the most cost-effective utilities. Although the data in IB-Net do not permit an analysis of the mechanism responsible for this finding, a likely explanation is that an organizational structure that is already designed to serve several towns can more easily integrate additional systems without any detrimental effects.

Cases of this type of aggregation can be found in Hungary between 1995 and 2005. Poland also experienced a number of such aggregations during the 2000s. More recently, aggregations of this type have occurred in Serbia and in Mexico.

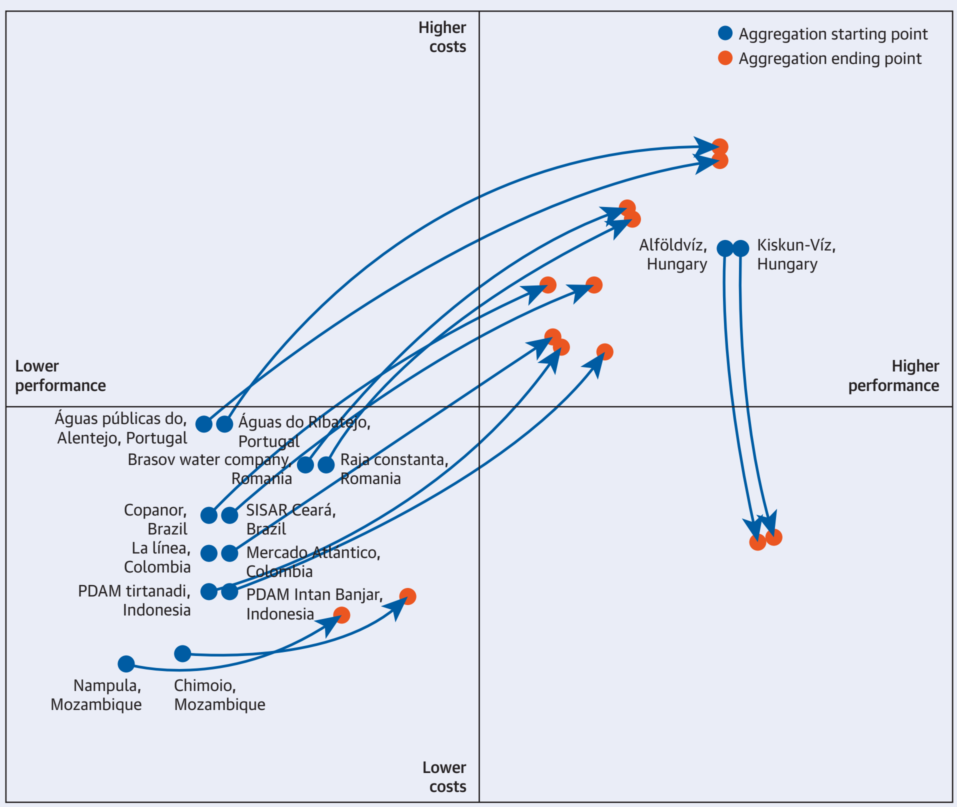
Aggregations that involve small or weak utilities tend to improve their overall performance, but costs do not decrease as economies of scale are reinvested into maintaining the improved services.

Aggregation of utilities that have low initial performance produces larger performance improvements than in utilities that do not aggregate. This is true for both managerial efficiency as well as overall performance (measured through the WUPI). In contrast, aggregating utilities with higher initial performance are not more likely to improve performance than comparable non-aggregating utilities. There is even some evidence that utilities that have high initial performance experience lower postaggregation coverage, possibly as they take

BOX 4.5. Aggregation Success Path: Starting from Low Cost-Low Performance, Going through Higher Cost-Higher Performance, to Reach High Performance-Lower Cost

Evidence that many of the observed aggregations primarily helped improve performance rather than lower cost also appears in the case studies. To describe this pattern, a graphical representation of the starting point (yellow dot) and the aggregation outcome (blue dot) is proposed. As shown in figure B4.5.1, the overall "reform path" was to improve performance first and only secondarily to improve the cost situation. For all case studies starting from a low performance level, aggregation was an opportunity to benefit from a Big Push, through incentivized investment plans that had financial support from national authorities or external partners. This helped them move toward a higher level of performance and capacity, thus escaping the low-level equilibrium trap. However, this quality improvement was achieved through higher costs. The only exception is the Mozambique case study of Nampula, which planned a major investment required for water source augmentation that never materialized. It appears to be stuck in the low-level equilibrium trap. In Hungary, it appears that the two utilities started from a relatively high performance level, albeit at higher cost. As overall performance was not the main issue there, the aggregations enabled them to generate economic efficiency gains.

FIGURE B4.5.1. Starting Point and Aggregation Outcome for Case Studies



over utilities that have lower service coverage—and through this also experience lower overall performance. Conversely, the fact that no unit cost improvements are observed in utilities that have low initial performance suggests that such utilities can benefit from aggregations by improving quality rather than by reducing costs. This is consistent with the view of aggregations as a reform option to enable utilities to leave a low-level equilibrium, as well as with results from a report showing that utilities in the Danube region with greater performance generally charge more to their customers (World Bank 2015). Such moves to higher levels of service generally entail significantly higher investment and subsequently operating costs, which means that economies of scale are "reinvested" into maintaining higher levels of service. Only when utility companies have a good initial performance are they able to lower costs through aggregation (box 4.5).

Examples of aggregations involving low-performance utilities are not concentrated in a single country or period but were observed more frequently in Kazakhstan, Romania, and Poland. In Poland, the aggregations coincided with European Union (EU) membership, after which a number of weak utilities were merged. A small number of more recent cases of aggregations involving low-performance utilities can be found in Brazil.

Small utilities (in terms of volume or density) are also found to improve their performance through aggregations. One interpretation is that particularly small utilities benefit from aggregations that bring about greater technical and professional capacity. At the same time, there is no evidence that aggregations systematically decrease unit costs in such cases. The finding that small utilities seem to be able to improve performance through aggregation is related to the previous result for utilities that have a low initial performance level: Utilities that have low performance levels are more common in the group of small utilities (that is, the ones with fewer customers), and therefore it is not surprising that the empirical results show that small utilities and those with low initial performance levels can improve more through aggregation. Examples in this respect are the aggregations in Poland between 2004 and 2010. However, this finding does not apply to the aggregations that occurred in Hungary in the early 2000s. Although many of the aggregating utilities were small, only a few exhibited weak initial performance.

Notes

1. Aggregations were identified through changes in the number of served towns. This definition reflects the definition of aggregation adopted in chapter 2.
2. Data coverage in IB-Net starts in 1995, and the most recent data collections run through 2015.
3. For details of the statistical analysis and its results, see the supporting paper in the aggregation toolkit, available at www.worldbank.org/water/aggregationtoolkit.

Chapter 5

Why Do They Work? The Qualitative Evidence

This chapter focuses on the lessons learned from 14 concrete aggregation case studies in seven countries. It describes why these aggregations have worked well by highlighting success factors as well as risk factors that were successfully managed.

The 14 case studies present a variety of contexts, purposes, and designs of aggregation. In a majority of them, aggregations happened in a mixed context of urban and rural areas, except in Brazil where rural providers consolidated, and in Mozambique and Indonesia, where aggregation happened in urban and dense areas. Case studies exhibit a diversity of performance level from low for Brazil, Colombia, Indonesia, and Mozambique to medium for Romania and Portugal, and high for Hungary. The level of development of these countries also shows significant diversity: low-income for Mozambique; lower-middle-income for Indonesia; upper-middle-income for Brazil, Colombia, and Romania; and high-income for Portugal and Hungary. Processes and scopes of aggregation also contrast, whereas scale almost always follows administrative boundaries (except in Brazil). In the Hungary case study, the reform targeted mainly internalities and was done through a mandated process, whereas in other case studies externalities were sought, mainly through voluntary processes.

Figure 5.1 reflects the diversity of context among case studies, taking into account GDP per capita and performance. The size of each utility is also shown through the size of the dot representing the population served. The performance of each utility has been assessed qualitatively and ranked from low to medium to high.

Appendix A contains a complete overview of the case studies, presenting the context and purpose of each aggregation as well as the design and outcomes. In addition, a brief report on each of the case studies is available on the online toolkit.

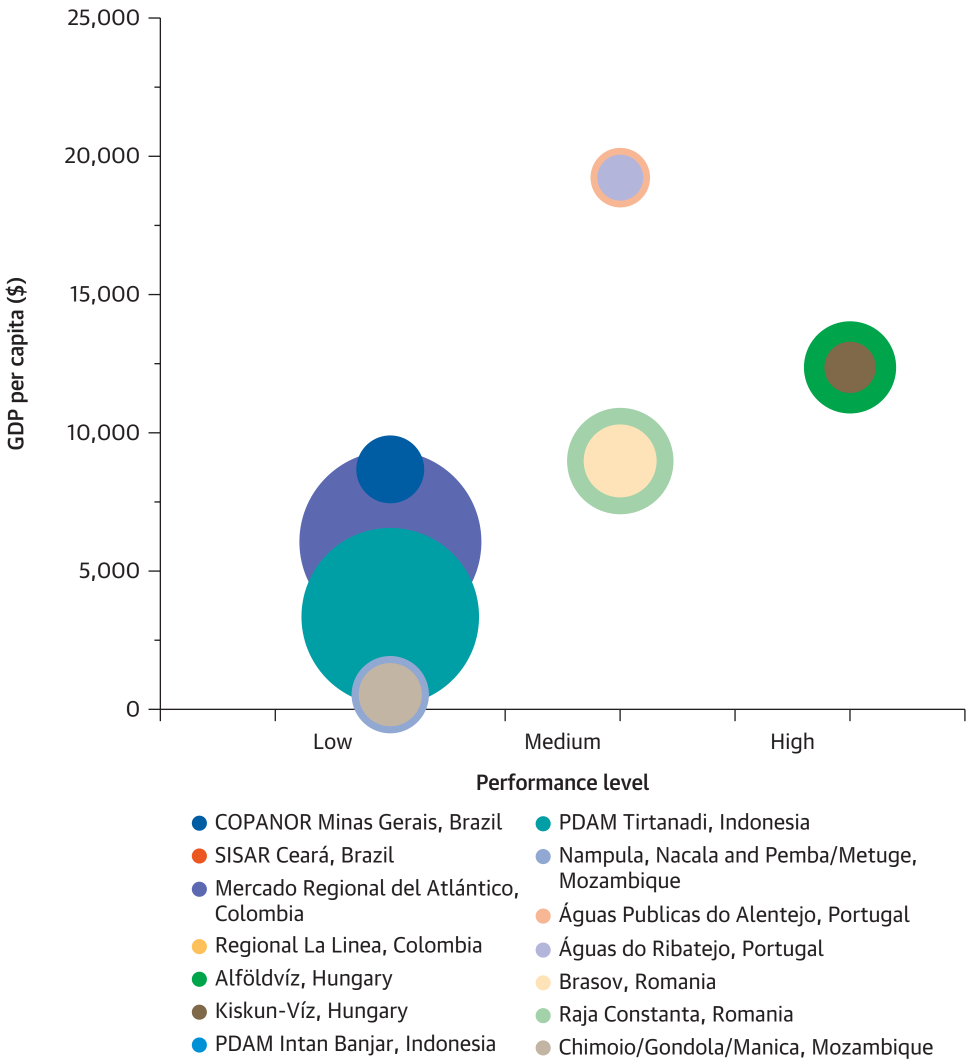
Key Success Factors for Aggregation

Having a stable champion throughout the aggregation often improves the likelihood of success.

In some case studies, aggregation has proven successful because of the presence of a local stakeholder acting as a champion among the aggregating service providers. This is especially true where this champion helped overcome political resistance.

- *In **Colombia,** the structuring of the regional aggregation "Mercado Regional del Atlántico," providing services in a large city as well as in small surrounding municipalities, was eased by the involvement of a political leader who facilitated the negotiation with mayors and other political actors. He also encouraged them to fully comply with their responsibilities, such as transferring all resources agreed upon in due time. As a result, the operator—Triple A—has received strong political support from the successive governors of the Atlántico region during the past 12 years, leading to a successful aggregation.*

FIGURE 5.1. **Diversity of Context among Case Studies**



- *In* ***Romania,*** *the Constanta County Council and the city of Constanta supported the operator, Raja Constanta, throughout the whole regionalization process. Moreover, the general manager of Raja Constanta is an important local and national leader in the water sector who has extensive experience in public administration and in business entrepreneurship in the private sector. He used to be the deputy mayor of Constanta and, as such, he directly took part in the institutional reforms in the water sector. In 2013, he became the president of the Romanian Water Association. Having such a leader proved crucial to overcoming political resistance when a municipality opposed a water tariff increase by unilaterally halving the price. Raja Constanta continued to charge fees according to the delegation contract provision and received support from the utility shareholders. Moreover, the stability of the executive management, which has remained unchanged since 2003, gave great credibility to the operator and enhanced its leadership.*
- *In* ***Portugal,*** *a mix of two actors was central to improve modernization of WSS: the new state holding company—Águas de Portugal—working with each region´s municipalities, which allowed several new regional or "multimunicipal" utilities; and the structural and economic regulator (IRAR, later ERSAR, Entidade Reguladora dos Serviços de Águas e Resíduos), overlooking the activity of "multimunicipal" entities, private concessions and, since 2013 when it became independent from the Government, services with municipal public management (whether direct or delegated). ERSAR had an important role in the shaping of the WSS sector, using its statutory power to implement a fine-tuning of the sector, exercising its regulatory powers over the utilities, and installing a comprehensive data collection and benchmarking system, as well as a national complaint treatment system binding on all utilities.*

Building ownership and aligning the interests of stakeholders at all levels is essential.

Between National and Local Stakeholders

When mandated, aggregation is generally designed at the national level. Nevertheless, systematic consultations with local stakeholders should still be organized early in the process to ensure they can inform the process and to confirm alignment of interests between the national and local levels. Such an early engagement helps build stakeholder ownership of the reform. It allows implementers to tackle potential problems or resistance, and diffuse their potential impacts, thus improving conditions for success.

- *In* ***Indonesia,*** *in the case of PDAM Tirtanadi, national and local stakeholders worked together to come up with the option best suited for aggregation, thus successfully aligning their interests. On April 20, 1998, the Ministry of Home Affairs provided a guideline to PDAM Tirtanadi on the establishment of a holding company as one of the options to aggregate and improve WSS in North Sumatra. However, on April 30, 1998, following a review of the guideline by the PDAM Association of North Sumatra, PDAM Tirtanadi decided that its preferred aggregation option was to arrange specific cooperation agreements with other local PDAMs. This aggregation option was then presented to governors and heads of districts for approval. Two years later, the cooperation agreement between PDAM Tirtanadi and PDAM Tirta Deli was signed.*
- *In* ***Romania,*** *the alignment of national and local interests was an important issue during the regionalization process. Since 2005, Romanian local authorities, whether at county or municipality levels, have been questioning the regionalization reform designed by the central government. Owing to the pressure to absorb EU funding, the reform was passed quickly, which did not allow for proper information and engagement with local authorities and citizens. The government prepared master plans for each county and did not have time to complete them with more comprehensive technical and economic data, informed by local governments. As a result, the whole process was perceived as a top-down takeover of water services, with hostility from local authorities and citizens escalating when tariff increases were applied.*

Among Local Authorities

A balanced institutional arrangement in which consensus reaching is embedded is key to aligning local interests and easing decision making in aggregated utilities. Local authorities may often perceive aggregation as a loss of control over a local public service that they are used to managing, especially when small municipalities aggregate with large ones. Moreover, different local authorities may pursue different objectives when aggregating. As a result, to ensure a successful aggregation, it is important to build ownership and align the interests of all local authorities joining the aggregation, leaving ample space for local authorities to adjust the overall aggregation model to their specific circumstances. In addition, alignment of interests is generally done through balanced decision-making arrangements and voting rights allocation. These governance issues are discussed and developed further in chapter 6.

Between Local Authorities and Utility Executive Management

Strengthening the working relationship between local authorities and utility executive management is a key to good governance of aggregated utilities. When services consolidate into a shared organizational structure, they gain autonomy from local authorities. As a result, the executive management of the aggregated utility becomes the body responsible for financial planning and tariff policy, investment program implementation, service operation, administration, and commercial activities, as well as customer relationships—functions that used to be under the direct control of local authorities. Nevertheless, some decisions, especially regarding tariff policy, still must be approved by utility shareholders during general assembly meetings. Establishing a close and stable working relationship between local authorities and the utility board of directors and management can help align stakeholders' interests

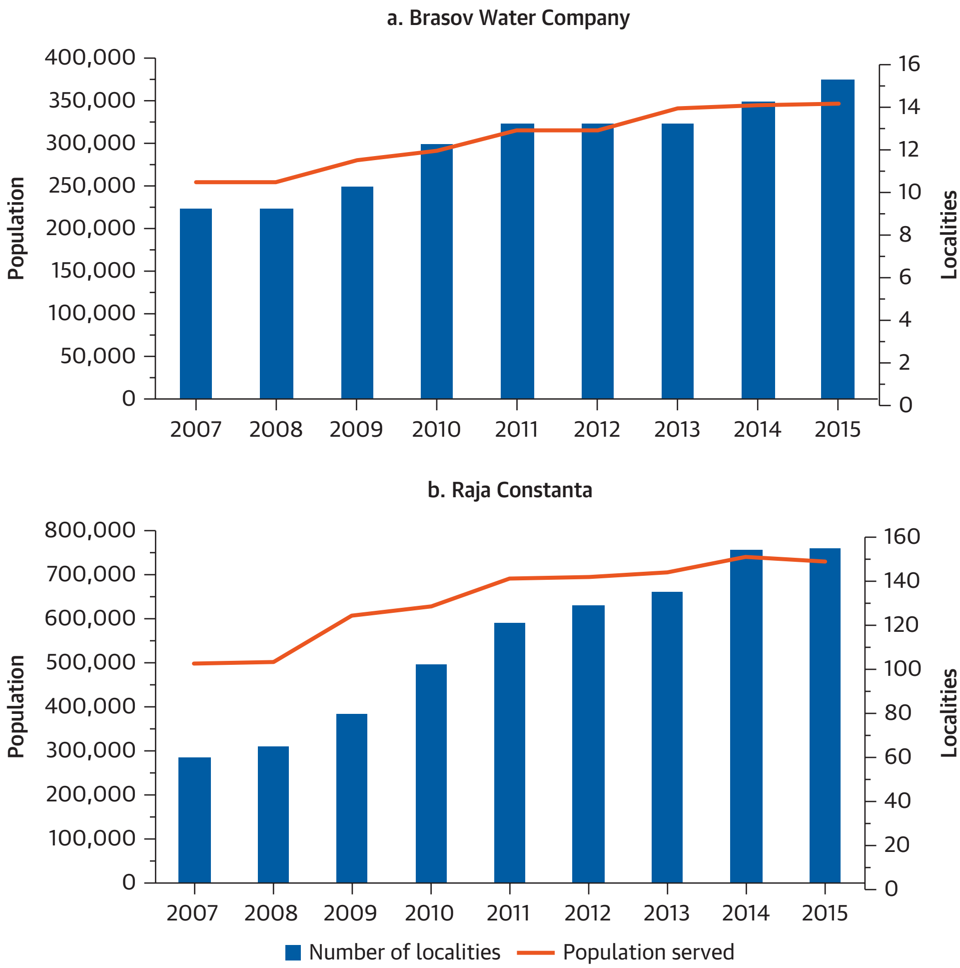
- *In **Romania,** the president of the Brasov Intercommunal Development Association (IDA), which includes some municipalities served by Brasov Water Company, is invited to all BWC Board of Directors meetings to ensure that the company's management takes into account the views of the IDA. Moreover, the executive managers must meet a set of objectives and performance that are monitored by directors and reported on during meetings with shareholders and IDA members.*
- *In **Brazil,** the executive structure of SISAR Ceará includes a board of directors with presidents and chairpersons affiliated with member associations, which hold a vote in the general assembly.*
- *In **Portugal,** aggregated municipalities have their own representatives at the Board of Directors.*

Defining principles but allowing flexibility in implementation ensures local ownership.

In most case studies, aggregation reform was implemented as a top-down process led by national stakeholders. This finding is consistent with the global aggregation trends observed at the international level, as discussed in chapter 3. However, national reforms are more likely to be successful when they follow the principle of subsidiarity and allow flexibility for local stakeholders to own the aggregation process and adapt it to their local context.

- *In **Romania**, the regionalization established by the 2006 law on public water services consisted of the reorganization of public services through two entities: the intercommunal development association (IDA), representing local governments as asset holders, and the regional operating company (ROC), operating those assets, both of them linked by a delegation contract. However, utilities had the choice to aggregate following their own pace and according to their preferred scale. Brasov Water Company expanded slowly and progressively in the nearby municipalities, whereas Raja Constanta expanded over seven counties at a fast pace (figure 5.2).*
- *In **Hungary,** the Water Utility Services Act, passed in 2011, states that water licenses will be issued to providers that reach a certain level of aggregation, expressed in consumer equivalent. But no administrative limits, such as watershed or regional boundaries, were set.*

FIGURE 5.2. Comparison of the Expansion Strategies Pursued by Two Romanian Utilities



The utility of Kiskun-Víz opted for a quick implementation of aggregation and reached its final aggregated size by 2013, four years ahead of the legal deadline. The utility of Alföldvíz increased its operating area by 70 percent in three years, reaching a consumer-equivalent market four times higher than the regulatory threshold.

- *In* ***Colombia,*** *the various National Development Plans designed and implemented by the central government have all included references to aggregation, encouraging it through guideline documents, through the opportunity to establish regional markets or through the promotion of association schemes for municipalities.*
- *In* ***Portugal,*** *the central government created in 1993 a "multimunicipal management" model to improve WSS "bulk" systems through regional entities, owned by Águas de Portugal, a state-owned holding, as a majority shareholder. However, several municipalities resisted the implementation of this model for fear of losing their WSS responsibility. In 2009, the central government introduced a new management model for bulk and retail services, called state/municipalities partnership, to facilitate further the potential for aggregation in the WSS sector (figure 5.3).*

Results take time; gradual improvement strategies with a consequent focus on results are particularly successful.

Both the design and implementation of aggregations take time; in particular, implementation is a continuous process that can spread over decades. Among the case studies, design periods lasted between 1 and 9 years, and implementation periods between 1 and 22 years (table 5.1). Consequently, aggregation benefits also take time to materialize. A strategy of gradual improvement in the main purpose of the aggregation proved successful in many case studies, as it spread the efforts and changes to be made over time, thus not burdening utilities with having to do too much too quickly. It also allowed for a greater focus on tracking and achieving concrete results (box 5.1).

FIGURE 5.3. **Institutional Arrangements for Bulk and Retail Systems Management in Portugal**

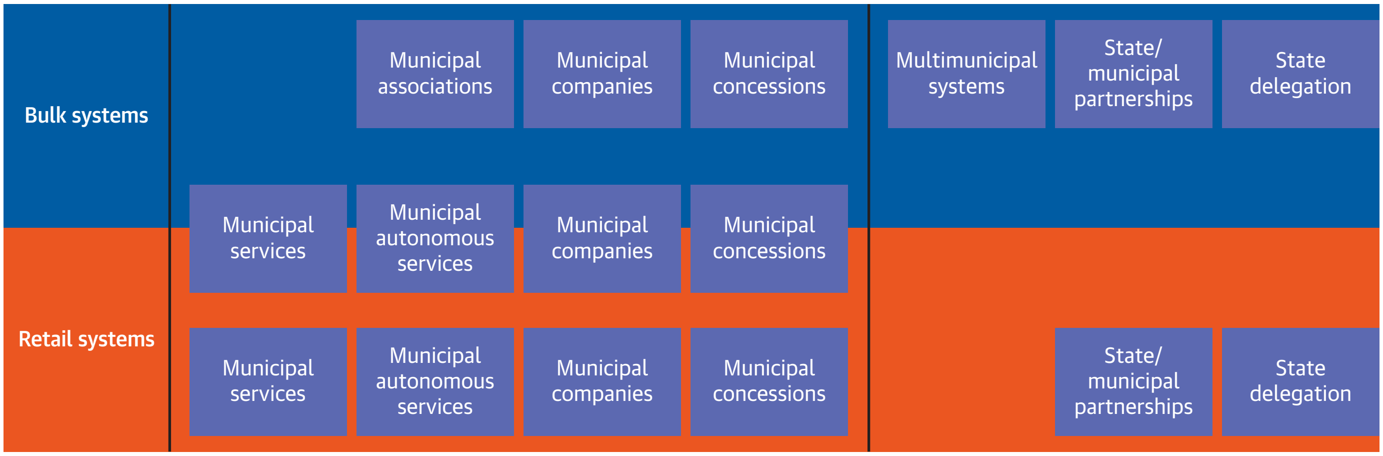


TABLE 5.1. **Overview of Aggregation Design and Implementation Duration**

years

Utility	Design	Implementation
COPANOR Minas Gerais, Brazil	1	10
SISAR Ceará, Brazil	1	20
Mercado Regional del Atlántico, Colombia	1	22
Regional La Linea, Colombia[a]	1	6
Alföldvíz, Hungary	1	3
Kiskun-Víz, Hungary	1	4
PDAM Intan Banjar, Indonesia	1	6
PDAM Tirtanadi, Indonesia	1	10
Chimoio/Gondola/Manica, Mozambique	1	1
Nampula, Nacala and Pemba/Metuge, Mozambique	1	6
Águas do Alantejo, Portugal	9	5
Águas do Ribatejo, Portugal	8	2
Brasov, Romania	2	10
Raja Constanta, Romania	2	10

a. Implementation of Regional La Línea (Colombia) was terminated prematurely, but Gescol operated for six years.

In some countries, the water sector aggregation reform itself was designed to be gradual so as to sequence efforts and changes at the local level.

- *In* ***Hungary,*** *the Water Utility Services Act states that water licenses will be issued to providers that reach 50,000 consumer equivalents in 2013-2014. This requirement increases to 100,000 consumer equivalents for 2015-2016 and to 150,000 in 2017.*
- *In* ***Romania,*** *BWC adopted a progressive approach to the expansion of service area. The number of water connections doubled in 10 years, while the population served grew by one-third. The utility chose to aggregate in nearby localities where investments were to be implemented and where service quality and tariffs could be increased at the same time (figure 5.4).*

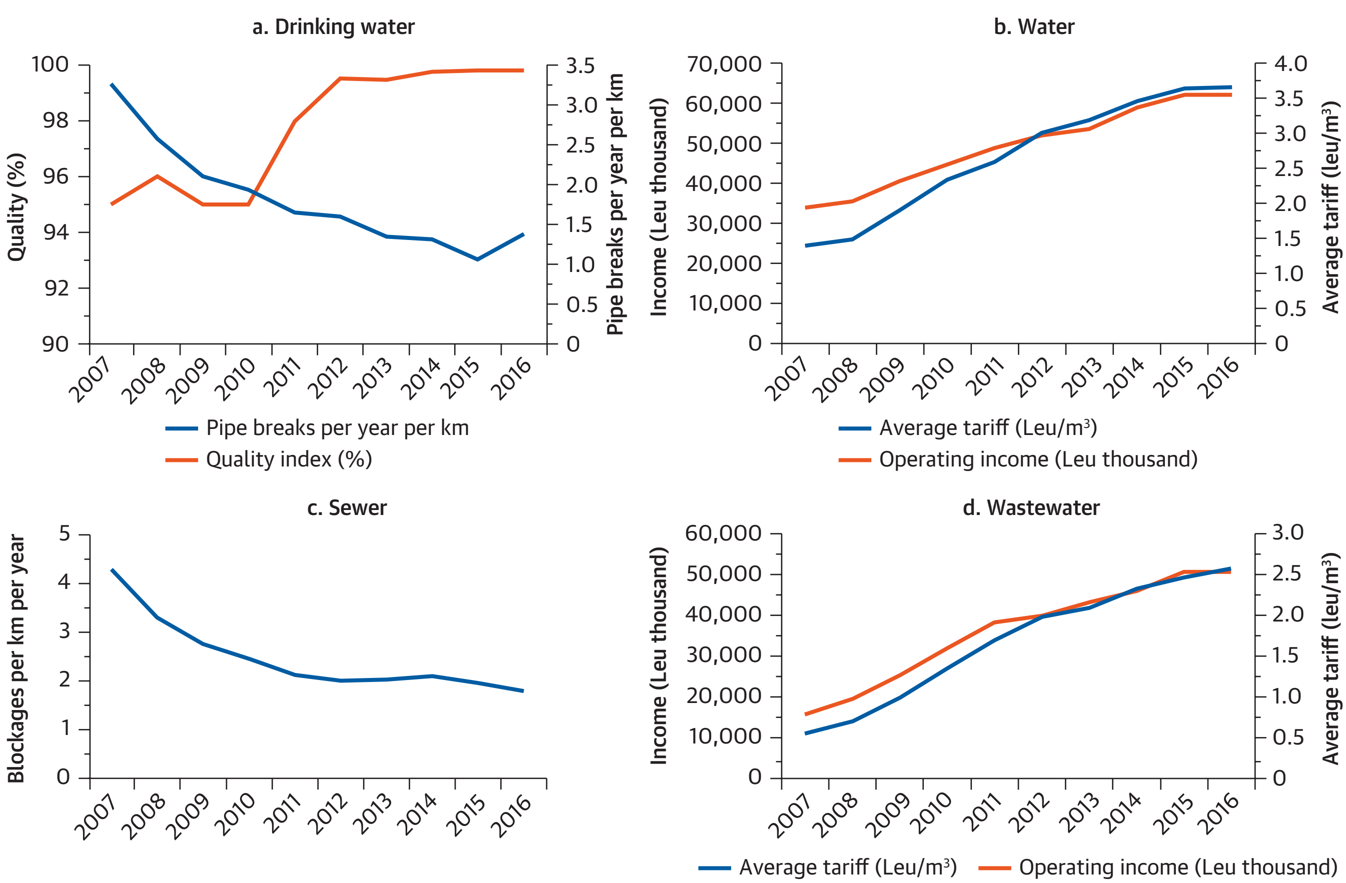
For example, BWC took over the Codlea water service operation after the new water line providing 24/7 good-quality water was completed. In such a way, BWC thought it would be able to provide good water service quality, thus increasing customers' willingness to pay and securing *invoice collection. The pace of aggregation was therefore calibrated toward gradual expansion of services with functional WSS systems.*

Gradual improvement strategies often use performance-based targets. This allows sequencing efforts in a step-by-step approach. Regular monitoring also facilitates accountability toward shareholders and customers as improvement can be steadily demonstrated over time.

BOX 5.1. Aggregations Introduced Performance Monitoring in Most Case Study Utilities

Collecting data on the economic efficiency and technical effectiveness of utilities is essential to assessing and improving their performance and sustainability. In 12 of the 14 case studies, the utilities were not used to collecting such data before aggregation. However, following the implementation of the aggregation, they started to routinely monitor performance indicators either as part of a benchmarking scheme (Portugal, Mozambique, Indonesia) or to be able to demonstrate progress within the framework of aggregation (Brazil, Romania, Colombia). As such, aggregation introduced better knowledge about utilities' operation with a view to improving it over time.

FIGURE 5.4. Evolution of Brasov Water Company key performance indicators after aggregation



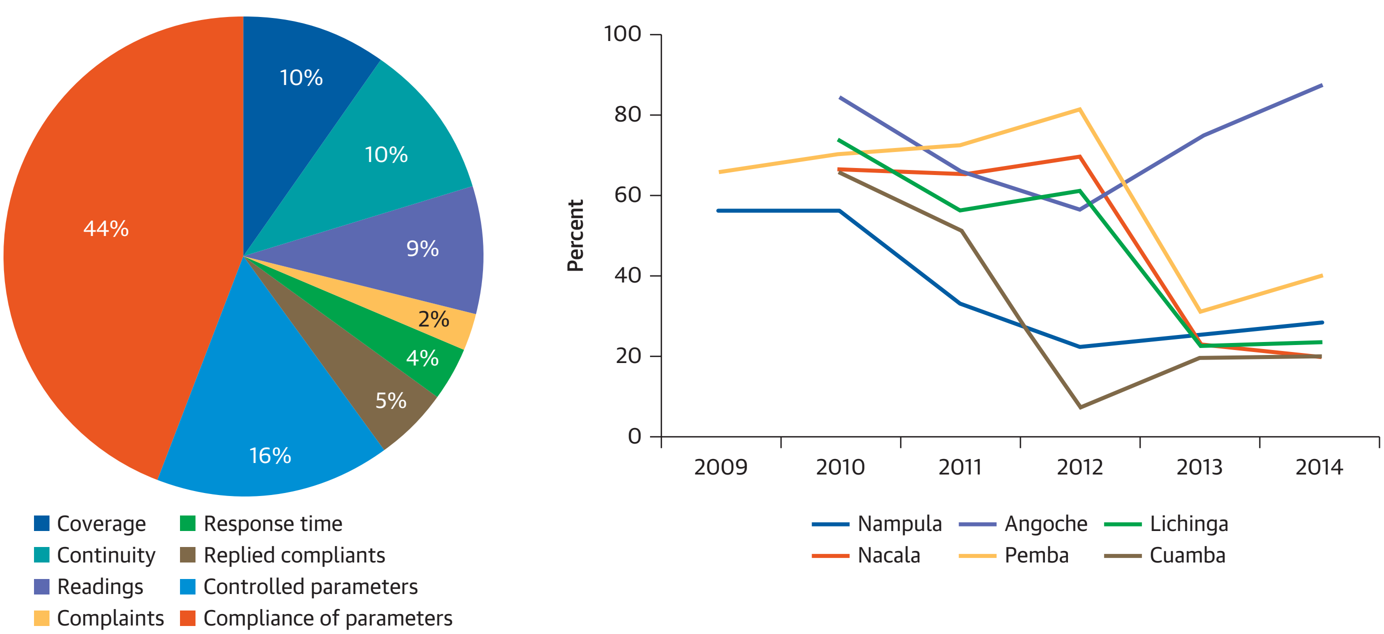
- *In **Colombia,** the operator Triple A was assigned gradual improvement targets in terms of micro-metering level, water quality, and billing collection ratio (table 5.2). When operation started in 2004, billing collection levels were very low, but after quality and continuity improvements, the operator was able to increase invoice collection to 90 percent.*
- *In the state of Ceará in **Brazil,** some performance indicators were selected and targets were set to monitor the gradual achievements of the aggregated utility, SISAR. The target for the water quality index was set at 95 percent; best performance presently fluctuates between 65 percent and 91 percent. The continuity of service provision target is 24 hours; present values range from 6 to 15 hours.*
- *In **Mozambique,** all FIPAG operating utilities report on performance indicators yearly. The IQS is an index based on eight indicators: coverage, continuity of service, percentage of invoicing based on actual readings, number of complaints per connection, average response in time and total percentage of complaints answered, number of water quality parameters controlled, and compliance with standards (figure 5.5).*

TABLE 5.2. Evolution of the Water Quality Indicator

Municipality	Water quality indicator, IRCA		Continuity (hours/day)	
	Before aggregation	2015	Before aggregation	2015
Sabanalarga	–	0.03	1.00	23.72
Baranoa	–	0.14	6.50	23.08
Galapa	–	0.16	–	23.70
Sabanagrande	–	0.16	18.00	23.57
Santo Tomás	–	0.14	2.00	23.65
Palmar de Varela	–	0.04	–	24.00
Juan de Acosta	0.84	0.18	–	–
Ponedera	0.86	0.32	–	24.00
Polonuevo	–	0.18	9.60	23.89
Tubará	0.57	0.15	–	–

Source: Triple A 2015.
Note: IRCA is a water quality indicator that combines physical, chemical, and biological variables. It ranges between 0 (out of risk) and 100 percent (unfit for health).

FIGURE 5.5. Structure and Evolution of IQS for FIPAG Northern Unit



Key Risks of Aggregation

When political leadership changes over time, aggregation can be jeopardized.

The flip side of having a champion as a success factor is that relying on the leadership of a single champion can sometimes be hazardous. Policy makers and aggregation promoters would do well to not design the aggregation around specific people and circumstances. Owing to political cycles, local representatives may not be re-elected. As a result, leadership stemming from a single local stakeholder may disappear over time, thus potentially jeopardizing the aggregation design and implementation.

- *In* ***Portugal,*** *the creation of Águas do Ribatejo took quite some time, as agreement on a management model was not immediate. In 2001, there were talks with Águas de Portugal to create a "multimunicipal" system, but this solution was dismissed. A second option was to create a common utility and allocate 49 percent of the shares to a private investor. A call for tenders was developed. At that time, the scale of the aggregation had reached nine municipalities. But after a change of political majority and mayor, Santarém, the capital and most populated city of the region, decided to withdraw from the process, considering that it would be subject to an excessive contribution to the common investment and operational costs and that it was not prepared to indirectly subsidize other municipal systems incorporated in Águas do Ribatejo. The municipality of Cartaxo also decided to leave. At the time, this decision was very contentious and strongly changed the premises of the aggregation. The tender was annulled, generating the need for a new consensus and new economic studies to support the feasibility of a common utility. The process resumed in 2007.*

Harmonization of administrative practices may level performance down and costs up.

When the scope of aggregation includes consolidation of functions, a harmonization of administrative practices across the aggregating service providers is necessary. In the best-case scenario, this harmonization leads to bringing standards up to those of best practices. However, under less favorable circumstances, harmonization may lead to bringing costs up, thus hampering the success of aggregation.

- *In* ***Hungary,*** *the three merging companies, Halasvíz, Kalocsavíz, and Kőrösvíz, brought different operational practices into the merged company, Kiskun-Víz. These practices were harmonized by selecting the "best practice" and introducing them in the operation of the Kiskun-Víz utility. For example, Kalocsavíz had an efficient system for the management of unpaid invoices, which was adopted throughout the aggregated utility. As a result, the overall level of unpaid bills was cut in half.*
- *In* ***Brazil,*** *COPANOR is a rural subsidiary of the state company COPASA. Most COPANOR employees earn the national minimum wage. However, there is significant pressure from the labor union to increase wages to levels equivalent to COPASA's. If COPANOR were to pay its workers the same wages as its "parent company" (COPASA) and continue to charge the same water tariff (capped at 60 percent of its parent company's tariffs, in 2015), the company's long-term financial sustainability would be jeopardized.*

As described in chapter 2, transaction costs occurring before, during, and after aggregation can hamper aggregation success, or limit and delay the materialization of its benefits.

Transaction costs can hamper aggregation success.

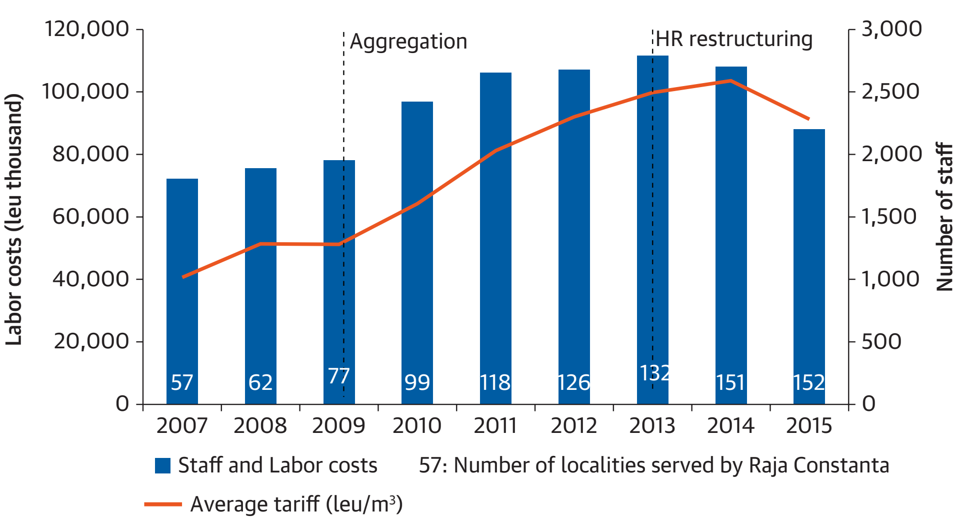
Labor Costs

Aggregation also brings along the issue of staff transfer from former municipal structures into the newly aggregated utility. This generally creates large transaction costs, which translate into labor cost increases (see chapter 4) and can hamper to some extent the financial sustainability of aggregated entities.

- *In **Romania,** the model delegation contract for the regionalization reform prepared by the Environment Ministry advocates for transferring all staff to the incumbent. Raja Constanta took on all employees from the former operators and committed to make no redundancy during the first two to three years of operation. But the services taken over were overstaffed and the number of employees at the aggregated utility increased by nearly 50 percent while salaries almost doubled (figure 5.6). The OPEX structure evolution for Raja Constanta shows the increasing share of labor costs throughout the aggregation process, rising from 30 percent to 36 percent. In 2013, the company launched a restructuring plan to adjust the number of employees, using a human resources consulting firm. Some 626 employees were dismissed (25 percent of total staff). Social protests were avoided, and only eight legal actions—all unsuccessful—were filed by former employees.*

- *In **Hungary,** following aggregation, human resources policies have focused on training programs and wage increases to attract and retain skilled staff. In the Kiskun-Víz utility, the salary gap between original and transferred staff was gradually closed by raising lower salaries to the highest level for similar jobs, with an average increase representing 8.5 percent over three and a half years. Other labor-related costs also increased, most notably the travel costs of specialized personnel in serving a larger service area and the cost of the daily commute (free minibus service to employees) to the headquarters for the larger number of personnel.*

FIGURE 5.6. Evolution of Labor Costs and Number of Staff in Raja Constanta Utility



IT Systems

Transaction costs related to the merger of IT systems between aggregating entities occur during aggregation implementation.

- *In **Hungary,** the aggregated utility of Kiskun-Víz selected the customer databases and invoicing systems from Halasvíz, one of the aggregating providers for continued use,* *and data were migrated from the other aggregating companies. This created a one-off cost for 2012–2013. Customer service operations were suspended for one day for the transition. After the merger in September 2013, Kiskun-Víz issued its first invoice in November 2013. The consolidated system for the management of outstanding invoices was ready in 2015.*

Not acknowledging context and purpose when designing an aggregation can lead to failure.

As stated in chapter 2, context should be taken into account and purpose has to be clarified when designing aggregation. Disconnecting the former from the latter can lead to failure (box 5.2).

- *In* ***Colombia,*** *the regional scheme La Línea, formed to build and operate an aqueduct, failed for various reasons linked with overlooking the context. During the structuring of the regional scheme, investment needs were underevaluated. Technical studies failed to capture demand needs because the population data were obsolete. Moreover, the aggregation did not benefit from the support of a local political leader. Because of this lack of local political empowerment, mayors transferred only 86 percent of the financial resources committed to the project. As most of the investment was to be subsidized, the operator failed to implement the*

BOX 5.2. The Importance of Understanding Context: The Croatian Experience

Since 2012, the Croatian government has been initiating a series of utility sector reforms which, in addition to establishing a proper water sector regulatory framework and benchmarking system, have included a proposed merger of utility service providers into about 20 regional utilities. The main drivers of this aggregation effort were the need to efficiently absorb EU funds and to cross-subsidize the operation of water and wastewater systems in smaller settlements, which would find compliance with the new EU standards prohibitively expensive and unaffordable. The process was also seen as an important opportunity for the sector to develop modern, efficient service providers and to move away from the previous way of managing municipal water utilities. The water utility aggregation process was initiated as a central government-driven, top-down activity, with the country divided into water service areas, mostly defined by county boundaries, using the principle of one service area, one service provider, one tariff. It was planned as a two-stage process, where in the first stage WSS services were, where necessary, extracted from municipal utility companies, while in the second stage they were to be aggregated into new WSS utilities (effectively trading scale for scope). A large-scale, ex ante study had demonstrated the likelihood of important economies of scale.

After completion of the first phase, in early 2015, aggregation design was completed along with the required legislative framework. However, owing to the sensitivity of the political situation at that moment (2015 was an election year) and potential backlash from local authorities, it first was delayed and then lost political support following the change of the central government. The reform had been driven largely by technocrats within the line ministry, who failed to acknowledge that they lacked the political champion and national government power to impose the reform process over the concerns of local stakeholders.

investment and ensure service provision was enhanced as required. In addition, the aggregation suffered from the absence of a large populated city to act as a nucleus and allow the implementation of cross-subsidies among settlements to balance differences between urban and rural water systems, which do not have the same production costs.

Cherry-picking practices can undermine the outcome of an aggregation whose purpose involves externalities such as cross-subsidies or capacity transfers.

In designing and implementing an aggregation, a risk of cherry-picking (Franceys and Gerlach 2008) practices can arise. Service providers naturally prefer to extend services to wealthy populations for cost recovery reasons, and to easy-to-reach areas where infrastructure already exists. By doing so, they select solvent customers for good revenue collection and seek to avoid sunk investment costs and associated OPEX increases (box 5.3).

- *This situation occurred in* ***Mozambique*** *where cherry-picking practices were motivated by the low commercial attractiveness of urban water services. The initial plan of the Mozambique government, launched in 1998 and called the Delegated Management Framework, was to differentiate investment and operation functions for urban water services. The investment function for all urban water services was to be aggregated into an autonomous public entity, the "Fund for Investment Ownership and Water Supply Assets" (FIPAG in its Portuguese acronym), and the operation function delegated to private operators through bidding processes. The first call for tenders, issued in 1999, was concluded in 2004 for Maputo and four other major cities. But the contract was prematurely terminated in 2010 for commercial reasons. FIPAG launched several other bids, which remained unsuccessful as urban water services suffer from low revenue collection and significant political interference in tariff policy. The lack of private sector interest in managing urban water services prompted FIPAG to become the operator of urban utilities across the country.*

BOX 5.3. Investment Costs and Increased Operational Expenditures: Evidence from Case Studies

When aggregation aims to expand coverage or environmental benefits, it often implies important parallel investment costs, which increase depreciation costs and operational expenditures (World Bank 2015). Thus, cost savings from economies of scale might be masked by the higher overall operating expenditures resulting from better services.

In Romania, both Brasov Water Company (BWC) and Raja Constanta implemented large investment projects, amounting respectively to €200 million and €278 million, to improve WSS coverage and quality. Following these investments, BWC total OPEX increased by 120 percent for water and 144 percent for wastewater, and OPEX per population served increased by 63 percent for water and 80 percent for wastewater over nine years. In the meantime, depreciation costs increased by 58.5 percent for water. For Raja Constanta, the increase in total OPEX represents 84 percent for water and 79 percent for wastewater over nine years whereas the OPEX per population served increased by 26 percent for water and 30 percent for wastewater over the same period. In the meantime, depreciation costs raised by 1,260 percent for water, and 118 percent for wastewater.

- *In **Romania,** the aftermath of the regionalization reform revealed cherry-picking practices, as some aggregated utilities have extended their operating areas in towns where financial incentives were granted (box 5.4).*

When aggregation is not only aiming at economic efficiency but also at externalities such as cross-subsidies, binding rules must be put in place to safeguard the principle of solidarity and overcome cherry-picking practices.

- *In **Hungary,** when aggregation reform was passed in 2011, the Alföldvíz utility decided to actively pursue the enlargement of its operating area and carefully selected the municipalities where it would take over service provision. A dedicated "merger project team" developed a methodology to discriminate between potential merging municipalities. It used a checklist to evaluate and assign a grade to each municipality. Despite this selection process, discussions were held to learn whether an operating contract should be signed with small, unprofitable municipalities. Ultimately, a "principle of solidarity" was applied, aided by the fact that if these small, unprofitable municipalities were left unsupplied, the regulator might assign a provider of last resort, thus appointing a water utility to provide services in these locations.*

BOX 5.4. From Cherry-Picking to Withdrawal Practices in Romania

Over the regionalization process, IDAs have generally accepted all municipalities that wanted to join the existing ROC by signing the delegation contract. But some of them experienced difficulties in expanding their activity as quickly as needed to provide necessary and adequate services in the small settlements that they took over, often because of the lack of qualified personnel or financing. As such, IDAs were not "excluding" municipalities; however, they were to some extent cherry-picking municipalities that would bring along a source of financing. As a result, some municipalities now react by either rejecting or withdrawing from the aggregation, moves that may also derive from local political issues or other vested interests.

The municipalities that do not wish to join regional IDA and its ROC have applied for the renewal of their water operating licenses. Although these municipalities have hardly any access to funding for water supply improvements, they prefer to remain independent than join the ROC and see their tariffs go up without any perceived benefit. There are even cases where municipalities have joined the IDA and ROC, and are presently withdrawing. For instance, in Neamt County, six communes left the IDA in 2015. The main reasons for withdrawal are much higher water fees for households and delayed extension or rehabilitation of water supply network/sewage systems. To prevent such issues, withdrawal procedures must be thoroughly justified and approved by the IDA General Assembly. In addition, withdrawing municipalities must repay investments made by the ROC in their territory and/or WSS systems.

Chapter 6 How Do They Work? Concrete Insights

This chapter describes, for the 14 case studies and in the light of the international overview, how aggregations have been concretely designed, following the report's original typology. It discusses, in particular, the nuts and bolts of setting up a successful aggregated service provider, ranging from deciding on scale and scope, to allocating power, to managing assets and liabilities, and harmonizing IT systems.

The chapter builds on the proposed four design dimensions of scope, scale, process, and governance (for more details, refer to chapter 2 and figure 2.1). Rather than providing recommendations, the review seeks to highlight the trade-offs and potential challenges associated with each of those design decisions. For a more complete discussion of the actual range of design option for each of the dimension, refer to chapter 2.

Scope

Although the scope of aggregation varies among case studies, the unbundling of functions, stages, and services is relatively uncommon as it might generate complexities of its own. Furthermore, all functions have been aggregated in all case studies, except in SISAR as the investment function remains at the state level while operations are carried out by SISAR and its members (see table 6.1). This finding is in line with the global trends observed at the international level, where all functions have been aggregated in 92 percent of aggregations (see chapter 3). All stages have been aggregated in all case studies except in Águas de Alentejo (Portugal), which supplies bulk water and is in charge of wastewater treatment only. Water and wastewater services have been aggregated in eight case studies. For four case studies, aggregation was limited to water service only, and for one case study the operator is in charge of WSS as well as waste collection.

In countries where WSS coverage is high, aggregations encompass water and wastewater services.

As observed at the international level, the scope of 86 percent of aggregations covers all functions and services (see chapter 3). Hence, the countries where case studies encompass water services only are the ones where wastewater services are comparatively less developed (Brazil, Indonesia, and Mozambique). As a result, unbundling of water and wastewater services seems a consequence of the limited development of wastewater collection and treatment rather than a result of a clear unbundling decision. In addition, the scope of aggregations also reflects the national organizational structure of the WSS sector. For instance, in Mozambique, despite the limited development of sanitation, water supply and sanitation services are being managed separately (figure 6.1).

TABLE 6.1. Summary of Scope Examples Taken from Case Studies

Case studies	Functions	Stages	Services	Issues and takeaways
COPANOR Minas Gerais, Brazil	All	All	WSS	Full-time employees performing itinerant maintenance in operating area; costly
SISAR Ceará, Brazil	All (operation split with communities)	All	Water	Community labor hired by local water associations; voluntary basis
Mercado Regional del Atlántico, Colombia	All	All	WSS and waste collection	PPP arrangement
Regional La Línea, Colombia	All	All	WSS	PPP terminated
Alföldvíz, Hungary	All	All	WSS	Uniform and high-level customer service, advanced IT solutions
Kiskun-Víz, Hungary	All	All	WSS	Adjustment to relocate headquarters, merger of IT and customer database
PDAM Intan Banjar, Indonesia	All	All	Water	No real modification prior and after aggregation
PDAM Tirtanadi, Indonesia	All	All	WSS	Transfer of capacity and technical skills
Chimoio/Gondola/Manica, Mozambique	All	All	Water	Benefited from capacity and technical assistance
Nampula, Nacala and Pemba/Metuge, Mozambique	All	All	Water	Benefited from capacity and technical assistance
Águas Públicas do Alentejo, Portugal	All	Water production and transport, Wastewater treatment	WSS	Solidarity between all municipalities through harmonized bulk tariff
Águas do Ribatejo, Portugal	All	All	WSS	
Brasov, Romania	All	All	WSS	2 main management centers with local day-to-day maintenance sites
Raja Constanta, Romania	All	All	WSS	Accounting practices improved and standardized across the board

Very few case studies of aggregation include unbundling stages between bulk and retail activities.

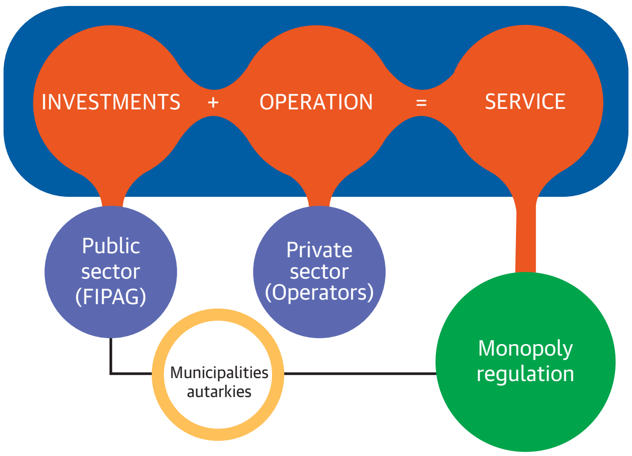
Aggregation of all functions is the common situation; however, there are examples of utilities where only some functions were to be aggregated.

In most cases, the aggregated provider provides all stages of water or wastewater services. This finding matches the global trends observed at the international level where the scope of 8 percent of aggregations encompasses stages or activities (see chapter 3). However, it should be noted that unbundling of stages is more prevalent in countries that have highly decentralized institutional organizations, such as Central European countries (box 6.3).

- *In **Portugal**, aggregation of WSS services can be done either by aggregating bulk stages or by aggregating bulk and retail stages. Data from the regulator ERSAR (2016) indicate that bulk aggregated water services represent 73 percent of the market while bulk aggregated waste-water services represent 77.4 percent of the market.*

Some aggregation reforms have tried to unbundle investment and operation functions of WSS. These reforms planned to aggregate the investment functions for many utilities into a single entity while leaving the operation function disaggregated at the municipal level.

FIGURE 6.1. **Institutional Framework of the Water Sector in Mozambique**



By doing so, they sought to mutualize the funding of sunk costs and depreciation costs associated with large WSS investment programs.

- *In **Mozambique**, the initial plan of the government was to aggregate some functions of water services by setting up an entity in charge of urban water asset management and investment across the country, namely Fundo de Investimento do Patrimônio da Água [Fund for Investment Ownership and Water Supply Assets] (FIPAG). The operation and maintenance of water systems was to be handed out to private operators through calls for tenders (figure 53). Water utilities regionalization was supposed to create an appealing market for private sector. However, despite several attempts to attract private operators, FIPAG had to take over operations in 15 cities in the Northern and Central regions. In utilities aggregated under FIPAG, consolidated procurement practices have been set up, which led to important savings when purchasing bulk chemicals.*
- *In **Brazil**, SISAR is in charge of the operation of rural water services either through its own employees or through the volunteers from its member associations, while the investment function has remained aggregated at the state level and is being funded by the state budget.*

Scale

Although aggregations along administrative boundaries are predominant, they do not necessarily encompass contiguous territories.

The scale of aggregation follows administrative boundaries for 12 case studies, whereas in Brazil, aggregation happened within watershed limits (as in Kosovo; box 6.1), and concerns only rural areas (see table 6.2). This finding corresponds to the generic situation of aggregations at the international level, where 56 percent of aggregations follows administrative boundaries (see chapter 3). However, it should be noted that in Romania, the original regionalization reform was aimed at aggregation within river basin limits but was achieved only at the county level. In Hungary, the provisions of the reform led to aggregation between towns that were not contiguous or even in the same administrative region, each provider being allowed to self-optimize its operating area (map 6.1).

The population and number of towns covered by an aggregation vary widely depending on the initial urban versus rural context.

Among case studies, the population covered by an aggregation varies in a ratio of 1 to 69, ranging from 32,000 inhabitants in the regional market La Línea (Colombia) to 2.1 million inhabitants in the regional market of Atlántico (Colombia).

- *In **Brazil**, where aggregations happened in rural areas, they cover 89,500 inhabitants in 153 settlements for SISAR and 303,843 inhabitants in 239 localities for COPANOR, thus showing a low population density. In such a rural context, aggregations tend to add few customers and decrease density (see chapter 4 and box 4.3), thus preventing the service from lowering its operation costs.*

TABLE 6.2. Summary of Scale Examples Taken from Case Studies

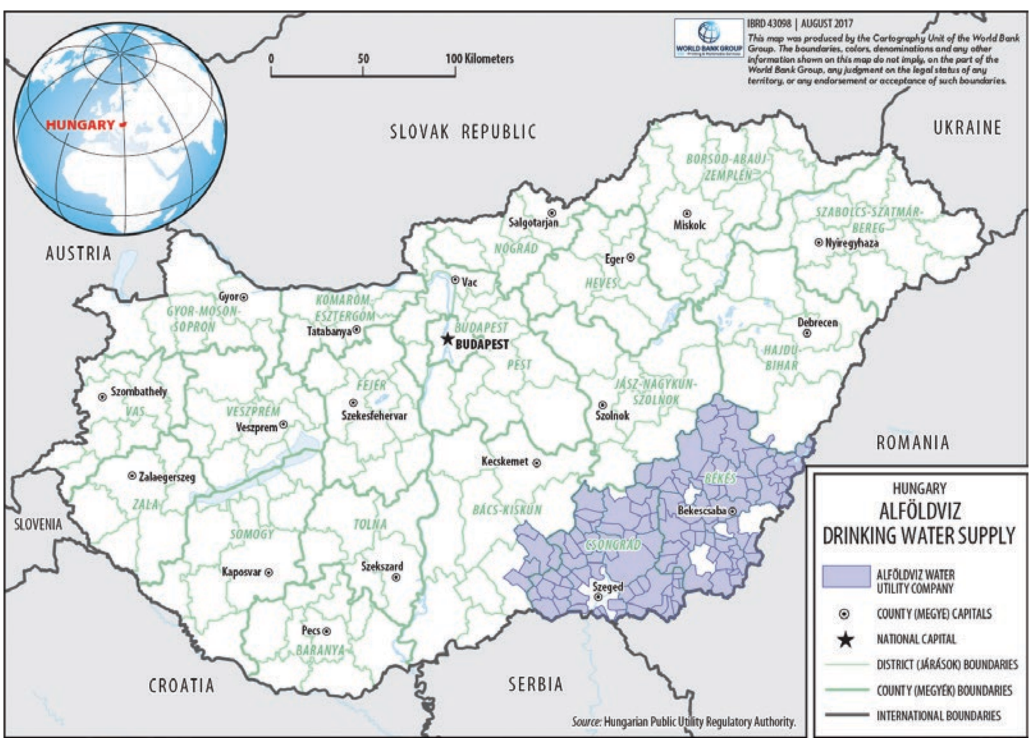
Case studies	Scale	No. of towns	Population served	Issues and takeaways
COPANOR Minas Gerais, Brazil	Watershed limits	239 (water) 74 (sewer)	303,843 (water) 137,835 (sewer)	Aggregation in rural areas with low population density; did not achieve operating cost recovery due to price cap
SISAR Ceará, Brazil	Watershed limits	153	89,500	Aggregation in rural areas with low population density; achieved operating cost recovery
Mercado Regional del Atlántico, Colombia	Administrative boundaries	15 (water) 8 (wastewater)	2,195,572	Aggregation in urban and rural areas with medium population density
Regional La Línea, Colombia	Administrative boundaries	4	32,000	Aggregation in urban and rural areas with low population density; contract terminated
Alföldvíz, Hungary	Administrative boundaries	131	564,000	Aggregation in urban and rural areas with low population density; lowered operating costs
Kiskun-Víz, Hungary	Administrative boundaries	54	175,000	Aggregation in urban and rural areas with low population density; lowered operating costs
PDAM Intan Banjar, Indonesia	Administrative boundaries	2	284,072	Aggregation in urban areas with high population density
PDAM Tirtanadi, Indonesia	Administrative boundaries	7	2,084,063	Aggregation in urban areas with high population density
Chimoio/Gondola/Manica, Mozambique	Administrative boundaries	3	263,101	Aggregation in urban areas with high population density
Nampula, Nacala and Pemba/ Metuge, Mozambique	Administrative boundaries	3	396,665	Aggregation in urban areas with high population density
Águas Públicas do Alentejo, Portugal	Administrative boundaries	20	235,192	Aggregation in urban and rural areas with low population density; increased operating costs
Águas do Ribatejo, Portugal	Administrative boundaries	7	139,853 Water / 96,654 wastewater	Aggregation in urban and rural areas with low population density; increased operating costs
Brasov, Romania	Administrative boundaries	15	350,000	Aggregation in urban and rural areas with medium population density; increased operating costs
Raja Constanta, Romania	Administrative boundaries	152	750,000	Aggregation in urban and rural areas with low population density; increased operating costs

- *In contrast, in* ***Indonesia or Mozambique,*** *where aggregations happened in urban areas, they exhibit high density (respectively 2,084,063 inhabitants in seven cities for PDAM Tirtanadi; 396,665 inhabitants in three cities for FIPAG Northern Unit; and 263,101 inhabitants in three cities for FIPAG Central Unit).*

BOX 6.1. Aggregation at Watershed Level in Kosovo

The main purpose of the Kosovo utility regionalization effort was to transform small and fragmented municipal companies into self-sustaining business organizations with a clear customer orientation and to create an environment conducive to attaining socioeconomic goals for the Kosovar population. The reform of the utility sector took place in the context of the authorities' EU integration agenda, which implied transposition of the relevant EC framework and adoption of prudent management principles and practices such as river basin management, integrated water resources management, and the like. Before the sector reform, 35 municipal companies offered water supply and wastewater collection together with other municipal services. The initiators of the reform, which was carried out in three phases, decided to follow watershed boundaries rather than administrative boundaries in a bid to be better prepared for the significant ramp-up in wastewater collection and treatment expected to be a consequence of the country's effort to join the EU (World Bank 2015).

MAP 6.1. Non-Contiguous Operating Areas of Alföldvíz Utilities



The number of towns in an aggregation varies widely among case studies, ranging from 2 cities for PDAM Intan Banjar (Indonesia) to 239 localities for COPANOR (Brazil). As stated in chapter 4, aggregations that add only a small number of towns are likely to achieve greater cost savings than aggregations that involve a large number of towns, such as large-scale regionalization schemes. Moreover, utilities serving several towns exhibit more complicated cost-output relationships. As a result, the possible cost savings of increasing the number of customers in these aggregated utilities are uncertain and limited.

Having a large utility as nucleus can work, but aggregation of similar-sized small utilities can also be successful.

As described in appendix A, most case studies display aggregation examples grouping urban and rural settlements. In such configurations, larger urban utilities act as the nuclei around which less populated, less profitable, and less well-performing service providers aggregate. The nuclei help surrounding service providers to improve.

- *In **Colombia,** the presence of a large city in the Regional Scheme of Atlántico, which is a development hub, allows for horizontal cooperation and economies of scale. It also allows the implementation of cross-subsidies among settlements and thus the balancing of differences among water systems that do not have the same production costs. In small and economically depressed towns, most users have low incomes and purchasing power that would not allow them to access public services otherwise.*
- *In **Indonesia,** one of the rationales for aggregation was to have PDAM Tirtanadi—which already had good technical, financial, and managerial skills—help other, smaller, surrounding PDAMs to build and develop those competences.*
- *In **Brazil,** the aggregation concerns only rural areas; however, while independent, the aggregated service provider was initially set up by and receives support from the respective large state utility, namely CAGECE for SISAR and COPASA for COPANOR.*

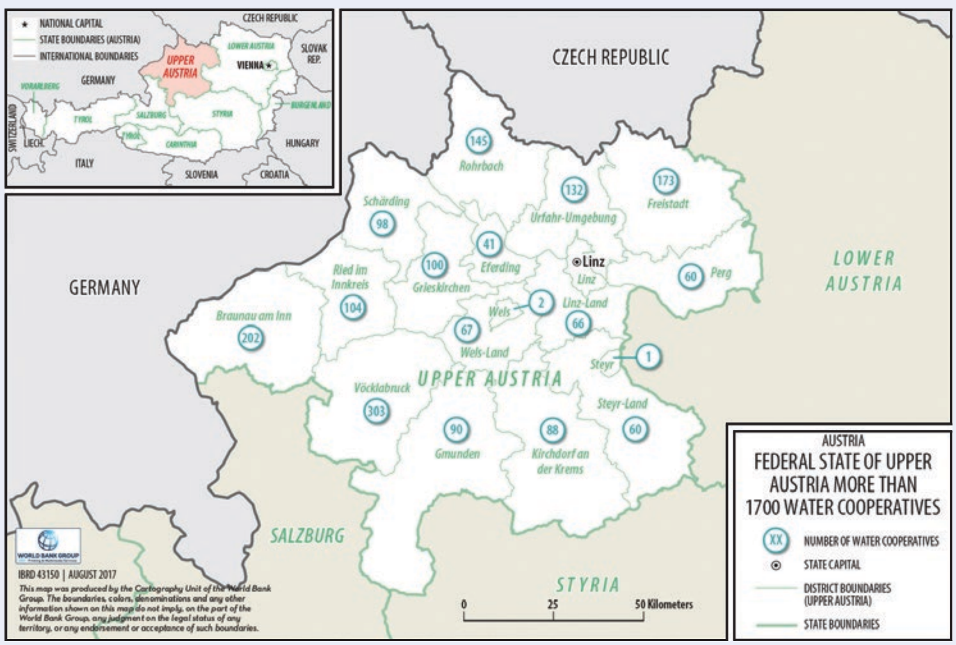
Although this heterogeneity of contexts between large and small utilities proved successful in some aggregations (see chapter 4), it also raises questions about whether to apply the same policies to all aggregating services and how to prioritize investments and service improvements. To some extent, there local preferences for service provision may differ. How the utility management responds to these challenges may vary from case to case, but it will need conflict resolution mechanisms to align interests and arbitrate between those that diverge . Alternative successful aggregation models exist when service providers with similar characteristics group together. The Hungarian utility Kiskun-Víz was created out of the merger of three water companies of more or less the same size; this aggregation was successful in terms of economic efficiency. In Austria, Upper Austria Water, an association of more than 1,700 cooperatives, also groups providers that have the same size and characteristics (box 6.2). Similar models exist in Paraguay and Honduras.

BOX 6.2. Alternatives to Large Utilities as Nuclei: The Example of Austria's Rural Associations

Founded in 1946, Upper Austria Water is an autonomous nonprofit association of more than 1,700 rural service providers located in the Federal State of Upper Austria (map B6.2.1). Chaired by a board of seven directors, it is in charge of operations and maintenance of small-scale water supply and sewerage systems in rural areas through technical assistance (emergency supply, mobile technical equipment), pooling programs (for water meter purchase and water analyses, for example), and measurement services (such as leak detection, pipe and valve location, flow rates and pressure, and aquifer tests). It aims to supply sufficient high-quality and cost-efficient drinking water through the construction and operation of autonomous installations. It also provides capacity building and staff training, and supports service providers on legal and financial issues. Similar models exist in other states of Austria.

MAP B6.2.1. Upper Austria Aggregation of Service Providers

More than 1,700 water cooperatives



Countries using aggregation as part of a broader sector reform package—for example, in the context of European accession—have usually settled on a mandated, top-down process.

Process

The process of aggregation was mandated by the national government in 4 case studies, all located in the EU and having the status of new Member States, in order to ensure that the reform would proceed rapidly and consistently throughout the country (see table 6.3). This is in line with the global trend identified at the international level showing that most aggregation happened in countries in Eastern Europe and Central Asia (see chapter 3). However, in Romania the process was heavily incentivized by EU Cohesion funds,

TABLE 6.3. Summary of Process Examples Taken from Case Studies

Case studies	Process	Financial support or incentives	External technical assistance	Issues and takeaways
COPANOR Minas Gerais, Brazil	Voluntary and incentivized	Supported by public funds	No	Investments financially supported, acting as Big Push
SISAR Ceará, Brazil	Voluntary and incentivized	Supported by public funds and incentivized by donors fund	Yes	Investments financially supported, acting as Big Push
Mercado Regional del Atlántico, Colombia	Voluntary	Supported by public funds	No	Investments financially supported, acting as Big Push
Regional La Línea, Colombia	Voluntary and incentivized	Supported by public funds and incentivized by donors fund	No	Failure to provide all public subsidies to fund investments, which led to termination of PPP
Alföldvíz, Hungary	Mandated	No	No	Investment backlog due to regulatory price cap
Kiskun-Víz, Hungary	Mandated	No	No	Investment backlog due to regulatory price cap
PDAM Intan Banjar, Indonesia	Voluntary and incentivized	Supported by public funds	No	Investments financially supported; allowed to increase water coverage (+62 percent in 5 years)
PDAM Tirtanadi, Indonesia	Voluntary and incentivized	No	No	Despite full cost recovery reached in 2013, tariff will increase to fund investment needs and maintain financial sustainability
Chimoio/Gondola/Manica, Mozambique	Voluntary and incentivized	Yes	Yes	Investments financially supported as part of the aggregation process allowed to increase water coverage (+22 percent in 4 years)
Nampula, Nacala and Pemba/ Metuge, Mozambique	Voluntary	No	Yes	Investment delayed by low resources and policy arbitration in favor of other local public services
Águas Públicas do Alentejo, Portugal	Voluntary and incentivized	Incentivized by donors fund	No	Investments financially incentivized, acting as Big Push
Águas do Ribatejo, Portugal	Voluntary and incentivized	Incentivized by donors fund	No	Investments financially incentivized, acting as Big Push
Brasov, Romania	Mandated and financially supported	Incentivized by donors fund	No	Investments financially incentivized, acting as Big Push
Raja Constanta, Romania	Mandated and financially supported	Incentivized by donors fund	No	Investments financially incentivized acting as Big Push

whereas in Hungary no financial support was provided to aggregating utilities. For the other 10 case studies, the aggregation process was voluntary, and often supported and incentivized through external funds.

Financial support and/or incentives (a "Big Push") are important to help services get out of the low-level equilibrium trap.

To boost the success of aggregation reforms, national and external stakeholders can provide financial support to aggregating utilities to help them achieve the aggregation purpose. In most cases, these subsidies are used to fund investment programs thus acting as a Big Push (box 2.1), which helps WSS service providers get out of the low-level equilibrium:

- *In* ***Colombia,*** *the operator Triple A benefited from investment programs to expand supply capacity that were funded by central and regional governments, representing up to US$50 million. On top of this funding, the financial incentives also took the form of a tax alleviation that was granted to public services companies during the period in which the law was in force. This tax discount could represent up to 40 percent of the investment amount.*
- *In Ceará state in* ***Brazil,*** *the investments implemented by the aggregated utility SISAR were funded for 18 percent by Federal credits and for 82 percent by the central government through loans from international finance institutions. SISAR investments were targeted toward initial setup of WSS infrastructure, as most localities covered by the aggregated utility had no water supply. In the state of Minas Gerais, the aggregated utility, COPANOR, was clearly established by policy decision makers to set up an investment program with funds originating from the state health sector budget.*
- *In* ***Mozambique,*** *FIPAG received funding from the Dutch government to improve the water intake, production, and transfers, as well as the distribution systems in Manica, Gondola, and Chimoio. The infrastructure of Manica and Gondola utilities was completely renewed and financed as part of the process of their integration.*

Long-term financial support can also be brought by external partners. Moreover, linking the allocation of external funds to the implementation of aggregation at the local level is a powerful incentive tool to align interests at the national and local levels:

- *In* ***Romania,*** *the Ministry of Environment took the opportunity of having EU funding to establish coercive eligibility criteria that helped trigger and speed up the aggregation reform, laid out in a Guide to Regionalization and Guidelines for Applicants for SOP Funds. The scale of aggregation of Raja Constanta was shaped by the SOP funds, as the utility chose to expand in municipalities that benefited from those funds, whether they belonged to Constanta County or not. As a result, Raja Constanta accessed an overall amount of €278 million in investment subsidies.*
- *In* ***Portugal,*** *to be eligible for EU Cohesion funds, utilities had to operate with a regional or at least supramunicipal scope, thus implying an aggregation trend (Decreto-Lei 191/2000, article 12). The utility Águas do Alentejo benefited from a €70 million investment in the form of EU subsidies, covering up to 58 percent of its investment programs for the period 2009–2015.*

The utility Águas do Ribatejo received EU funds that covered 60 percent of its investment program for the same period.

In contrast, when the main purpose intended is economic efficiency, no such incentives are necessary, as the example of Hungary shows.

Governance

Institutional Elements

Aggregations in EU countries have tended to use long-term delegated arrangements signed with public operators, whereas aggregations in other countries have tended to use mergers.

Among the 14 case studies, 8 have used a delegated contract for aggregation (57 percent), 5 a merger (36 percent), and 1 a special-purpose vehicle (7 percent) (see table 6.4). This overview contrasts somewhat with the findings of chapter 3 on international aggregation trends, where mergers are the prevalent governance arrangement (64 percent). The duration of delegated contracts observed among the eight case studies varies, with shorter length for PPPs (starting from 16 years) and longer contracts for public operators (up to 50 years) (table 6.5). Some 63 percent of delegated arrangements are found in EU countries

TABLE 6.4. Summary of Governance Examples Taken from Case Studies

Case studies	Legal form	Governance arrangement	Uniform tariff?	Asset transfer	Shareholder with majority	Staff transfer	Entry/exit rules	Issues and takeaways
COPANOR Minas Gerais, Brazil	Public company	Merger	Yes	No	Yes	No	Yes	"Itinerant" staff contribute to higher cost as not suited for scale and dispersion of rural settlements
SISAR Ceará, Brazil	Private association	Special vehicle purpose	Yes	No	No	No	Yes	Close relationship between communities and their water associations; community-based labor force hired part-time
Mercado Regional del Atlántico, Colombia	PPP	Delegated	Yes	No	Yes	No	Yes	Strong political leadership and accountability mechanisms
Regional La Línea, Colombia	PPP	Delegated	No	No	No	No	Yes	PPP terminated partly because of lack of local political empowerment
Alföldvíz, Hungary	Public company signing cooperation agreement	Delegated	No	Yes	No	All	Yes	Creation of a "merger project team" dedicated to expansion of service area, ensuring relationships with future member municipalities
Kiskun-Víz, Hungary	Public company	Merger	No	Yes	No	All	Yes	Best practice method used to harmonize administrative practices

table continues next page

TABLE 6.4. continued

Case studies	Legal form	Governance arrangement	Uniform tariff?	Asset transfer	Shareholder with majority	Staff transfer	Entry/exit rules	Issues and takeaways
PDAM Intan Banjar, Indonesia	Public company	Merger	Yes	Yes	Yes	No	No	No modification in governance following aggregation
PDAM Tirtanadi, Indonesia	Public company signing cooperation agreement	Delegated	No	No	No	Partly	Yes	Technical and management skills from PDAM Tirtanadi to be transferred to other PDAMs through cooperation
Chimoio, Gondola, and Manica, Mozambique	Public administration	Merger	No	Yes	Yes	All	No	Performance-based monitoring, technical and capacity assistance provided by FIPAG
Nampula, Nacala, and Pemba and Metuge, Mozambique	Public administration	Merger	No	Yes	Yes	All	No	Performance-based monitoring, technical and capacity assistance provided by FIPAG
Águas Públicas do Alentejo, Portugal	Public company	Delegated	Yes	Yes	Yes	Partly	Yes	Resistance of municipalities overcome by partnership agreement with balanced powers between state and municipalities, implying need to search for consensus
Águas do Ribatejo, Portugal	Public company	Delegated	Yes for bulk, no for retail	Yes	No	Partly	No	Difficult agreement between municipalities, strong harmony since implementation period, solidarity between consumers of all municipalities
Brasov, Romania	Public company	Delegated	Yes	No	No	Partly	Yes	Political resistance (fear of losing control), accountability efforts through direct link with customers
Raja Constanta, Romania	Public company	Delegated	Yes	No	Yes	All	No	Staff transfer burdened the aggregation; supervisory control and data acquisition center

where contracts have been signed with public operators, whereas in Colombia contracts have been signed with private operators. Among the five case studies that used a merger, four are located outside of the EU.

As box 6.3 indicates, Europe harbors a wide variety of governance arrangements, in particular in federal countries such as Austria, Germany, and Switzerland, where local

TABLE 6.5. Summary of Delegated Contract Duration Among Case Studies, in Years

	Mercado Regional del Atlántico, Colombia	Regional La Línea, Colombia	PDAM Tirtanadi, Indonesia	Águas Públicas do Alentejo, Portugal	Águas do Ribatejo, Portugal	Brasov, Romania	Raja Constanta, Romania
Contract duration	16–40	16.5	25	50	40	49	49

BOX 6.3. Diversity of Governance Arrangements in Swiss Water Sector

In Switzerland, WSS services are strongly decentralized as they fall within the competences of cantons, which normally delegate the mandate to municipalities. For drinking-water supply, municipalities are autonomous when it comes to the choice of the structure and organization of the service. Given the very small average size of municipalities, the technical and financial capacity to manage complex tasks often do not exist. Therefore, municipalities often aggregate tasks such as bulk water treatment or wastewater treatment under special-purpose vehicles (Zweckverband). For instance, Seewasserverk Hirsacker-Appital is an intermunicipal association created to produce drinking water from water from Lake Zurich—a complex and costly task, given the country's high standards for water quality. The governance arrangement for the special-purpose vehicle clearly states that each member of the association is entitled to a share of the water produced corresponding to the distribution of capital costs and fixed operating costs. Each member pays variable OPEX, in accordance with the real quantity of water consumed. *Regionale Wasserversorgung St. Gallen* (RWSG), created in 1993, is a regional association of 12 eastern Swiss partners. Its main task is to ensure the operation of the lake water treatment plant in Frasnacht, and to produce, transport, and distribute drinking water to its members. Individual distribution to households, billing and accounting, and overall wastewater collection and treatment remain the responsibility of individual municipalities.

Beyond the common special-purpose vehicle arrangements, Viteos poses a unique example of a merger. This public company was created by municipalities to produce and distribute drinking water in Neuchâtel District. Swiss municipalities sometimes also resort to concession contracts with public operators: Lausanne's water service has signed concession contracts with 17 surrounding municipalities where it distributes bulk water, or sometimes retail water, on behalf of local governments.

governments have been left broad latitude to optimize their operation as they see fit and have resorted to customized institutional arrangements suiting their particular scope and scale needs, often using special-purpose vehicles. Irrespective of the governance model chosen, in most cases, local governments are the main shareholders of the aggregated service provider, but regional governments sometimes play a role as well.

Aggregation forces more explicit decision-making processes, leading to better corporate governance.

Aggregation involves the creation of a new, separate organizational entity that is accountable to more than one stakeholder. Therefore, aggregations present an opportunity to adopt sound corporate governance principles of autonomy and accountability, as described in *Characteristics of Well-Performing Public Water Utilities.* (World Bank 2006) and box 6.4. This corporate structure provides a series of advantages to the newly aggregated utility.

Corporatization gives **financial autonomy** to water utilities, as they have their own budget, duly separated from municipal budgets. Moreover, water companies make their own economic and financial decisions, especially regarding tariff policies, thus aiming at financial sustainability and resisting political interference.

BOX 6.4. Characteristics of Well-Performing Public Utilities

External Autonomy

- Although utilities do not have complete authority to set their tariffs, they are able to put forward proposals that are consistent with their overall revenue requirements.
- Although utilities do not have complete authority to set their tariffs, they are able to put forward proposals that are consistent with their overall revenue requirements.
- Public procurement rules, though considered intrusive, were followed without a significant impact on performance.
- Although most utility managers do not have total control of setting staff salary scales, they are able to hire and retain qualified staff.
- Most public utilities rely on government to source investment financing.
- Board members are generally appointed by the government to represent the interests of owners.

External Accountability

- All utilities are subject to well-defined performance targets.
- Performance contracts are useful tools for sharing information but have limitations for enforcing performance.
- The use of external auditors to enhance fiduciary responsibilities is almost universal.
- Most public utilities require authorization to secure external financing.
- External groups can be represented in utility advisory or management oversight bodies.
- Independent regulatory arrangements are the exception rather than the norm, because most utilities are regulated by their owners.

Internal Accountability for Results

- Senior management systematically reports to their boards on performance.
- Incentive-based systems for top management are common.

box continues next page

BOX 6.4. continued

- Staff members are also subject to rewards and penalties to achieve well-defined performance targets.
- Most public utilities have focused on training for improving staff skills.

Market Orientation

- Utilities outsource mostly noncore functions and retain core functions.
- Although benchmarking exercises are becoming common, there are no clear-cut paradigms for using data collected for improving performance.
- Most utilities are not involved in market testing.

Customer Orientation

- Public water utilities have developed billing and collection systems that best overcome specific constraints faced by various groups of customers.
- Public utilities actively survey their customers to learn their opinions and views.
- Customers have the opportunity to express their preferences regarding service options.
- Customers are informed about service changes or interruptions.
- Utilities have developed effective complaint mechanisms.

Corporate Culture

- Well-defined mission statements provide an internal indicator of good corporate culture.
- Performance is the basis for salary increases in most utilities.
- Utilities provide ample career opportunities to their staff and experience low turnover.
- Water utilities have training programs for their staff as part of their annual performance agreements.
- Staff members are informed of management decisions on a need-to-know basis.

Source: World Bank 2006.

- *In* ***Portugal,*** *Águas do Ribatejo, a public limited company created to provide bulk and retail water services, was able to set up a higher uniform water tariff in the seven municipalities in its service area. This new tariff represented a 7 to 8 percent increase in the two municipalities where tariffs were highest before aggregation and a 600 percent increase in the municipality that previously had the lowest tariffs. This tariff policy was viewed as a positive management improvement toward sustainability, as the price before aggregation was heavily subsidized by municipal budgets and did not reflect cost-reflective.*

Corporatization also brings **managerial independence** to utilities that can make their own decisions regarding staff recruitment or wage policy, thus lowering or preventing political interference and patronage.

- *In **Portugal,** when the public limited company Águas do Ribatejo was created, about 50 percent of its initial staff were transferred employees. The remaining 50 percent were selected by the utility during the implementation.*

Corporatization brings efficiency improvements as **utility managers and staff behave in a more business-like fashion**. Indeed corporatization is a way to modify the incentives of the WSS utility and make it act in a more customer-oriented way.

- *In **Romania,** both the Constanta and the Brasov water operators have been turned into commercial companies as a result of the regionalization reform. In both utilities, the executive management staff must meet a number of objectives and performance indicators which are monitored continuously by the Board of Directors, the General Assembly of shareholders, and the intermunicipal body.*

Establishing a system of checks and balances among shareholders is important.

As mentioned in chapter 5, a balanced institutional arrangement in which reaching consensus is embedded as a practice is key to align local interests and ease decision making in aggregated utilities. This alignment is generally done through decision-making arrangements and voting rights allocation.

In most cases, the power-sharing arrangement is done in such a way that it does not provide exclusive power to the largest city as a single shareholder, so as to ensure a balance of power and create incentives for consensus building.

- *In **Portugal,** the capital of Águas do Ribatejo is the infrastructure of the utility, and shares are allocated to municipalities according to the value of the asset they transferred: Almeirim, 15.45 percent; Alpiarça, 5.40 percent; Benavente, 16.44 percent; Chamusca, 8.15 percent; Coruche, 15.03 percent; Salvaterra de Magos, 14.19 percent; Torres Novas, 25.34 percent. In the Águas Públicas do Alentejo Partnership, the decision-making arrangements derive from the conditions of the state-municipalities partnership. Municipalities instituted a specific association—Associação de Municípios para a Gestão da Água Pública do Alentejo (AMGAP)—to represent them to the management of Águas Públicas do Alentejo. The utility capital is shared by Águas de Portugal (51 percent) and AMGAP (49 percent). However, even if Águas de Portugal is the majority shareholder, both partners have equal decision rights in the Partnership Commission, which is in charge of approving investment plans, budgets, tariffs, annual reports and accounts. The balance of power between the state and municipalities in the Partnership Commission and the existence of only two shareholders creates a need for a permanent search for consensus. In addition, municipalities also have to agree on common positions.*
- *In **Romania,** for Brasov Water Company, shares were allocated between Brasov Municipality and Brasov County Council, each receiving 42 percent. The remaining 16 percent were*

divided among six other localities, in accordance with the proportion of their inhabitants. Allocating equal participation to Brasov County Council and Brasov Municipality was aimed at balancing powers and reaching consensus to avoid unilateral decisions. In addition, under Romanian law, strategic decisions must be adopted by a vote of two-thirds, which in Brasov made consensus compulsory. For Raja Constanta, the County Council holds 97 percent of the shares while the 33 municipalities[1] served by Raja Constanta hold the remaining 3 percent, allocated in accordance with the water volume distributed in each settlement.

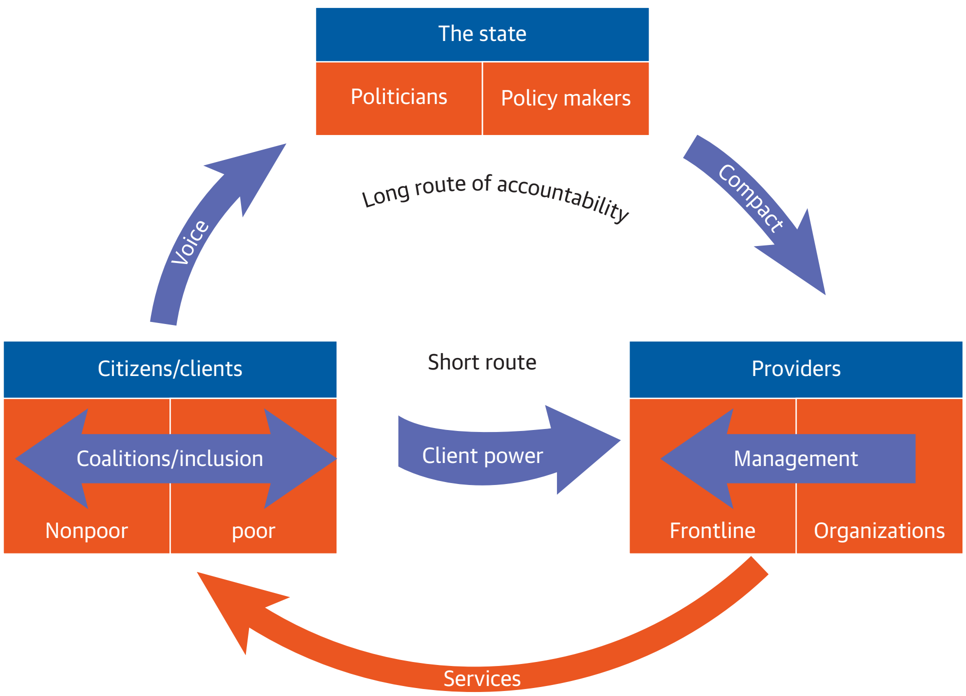
- *In **Brazil,** COPANOR was set up specifically for the aggregation as a public company, having as sole shareholder the state government of Minas Gerais and being a full subsidiary of a state-owned company. SISAR Ceará is a nongovernmental private organization based on rural community associations and governed by a general assembly, in which each affiliated association has one vote.*
- *In **Colombia,** both case studies relied on public-private partnership (PPP) contracts. For the regional market of Atlántico, the PPP contract was signed between each municipality and the private operator Triple A. For the regional market La Línea, the PPP contract was signed between the private operator Giscol and the intermunicipal company of public services held by four municipalities. The first PPP was an operation contract and the latter a build-operate-transfer (BOT) contract.*
- *In **Mozambique,** FIPAG is a public autonomous entity, created by the government, that is under the guardianship of the Ministry of Public Services, Housing, and Water Resources. It was created to own, manage, and invest in urban water assets. Despite the initial plan of the government to attract private operators, FIPAG had to take over operation and maintenance of utilities. In this context, the role of local authorities was significantly reduced, though some form of coordination remains, mainly for planning purposes. All other decisions are vested in FIPAG, which also appoints utilities managers from its own staff.*

Strong citizen engagement and clear accountability mechanisms should be put in place in parallel with the aggregation.

Accountability mechanisms, embedded in the aggregation and in routine processes, help reduce distance from customers and overcome political resistance. Although there are potential benefits from utility aggregation, providing services to a larger customer base increases the distance between the utility management and the end customer, making the utility less demand-responsive. Moreover, increasing the size of operations can cause misgovernance and accountability[2] issues (World Bank 2003). In the water sector, which is characterized by local natural monopolies and low client power, aggregation may reduce both the short and long routes of accountability. A "short route" of accountability is identified between citizen clients and service providers, and a "long route" between the state as representative of citizens' interests and service providers (figure 6.2).

To address those potential accountability issues, it is possible to strengthen the short route of accountability between customers and service providers by enhancing customer engagement mechanisms. To do so, newly aggregated utilities may internalize accountability mechanisms in their routine processes. These internalized mechanisms are helpful for

FIGURE 6.2. Accountability in Infrastructure Services



Source: World Bank 2003.

depoliticizing the provision of services, as they can create a "counterweight to the power of the owner" and help prevent political capture (Van Ginneken and Kingdom 2008).

- *In **Brazil,** the creation of SISAR Ceará, an organization based on community associations, required an intense participatory process, as every family in a community had to agree before the association could join SISAR. The São José investment project routinely involves rural workers' unions and producer cooperatives in its work. Along with the SISAR aggregation process, the social participation of communities and their associations has intensified, as several meetings and training sessions take place yearly.*
- *In **Colombia,** the water operator Triple A built a strong social and communication policy with communities before and during the aggregation. Awareness campaigns were organized before starting service provision and before installing metering. These campaigns focused on water-saving behaviors, appropriate water uses, timely payment of utility bills, and so on. Triple A also carried out annual health brigades and supported training for social control committees. Meetings with social leaders were also organized to explain how the company operates, how the service provision systems work, what the company contractual obligations are, how utility bills are calculated, and so on. Meetings were also held with mayors, councilors, and active members of the administration.*
- *In **Mozambique,** conducting surveys regarding customers' satisfaction is not common practice yet. The first assessment of customer satisfaction was conducted for eight systems in three regions, among them Nampula and Pemba in the Northern Region. In these cities, more than half of the population surveyed does not consider the service provided to be of good quality (figure 6.3).*
- *In **Romania,** as a consequence of agreements signed with the European Bank for Reconstruction and Development and the EU Commission, the Brasov Water Company implemented a range of measures to improve accountability. Information programs on investment projects were carried out in schools. Reaching out to students and teachers also proved a good way to reach*

FIGURE 6.3. Customer Satisfaction Survey for Nampula and Pemba

Source: Water Regulatory Council 2007.

out to parents. To respond to complaints related to tariffs, the introduction of metering, or discomfort caused by the works, villages could file water petitions. They were then transmitted to the company and dealt with through individual responses or through the organization of meetings at the request of residents. In addition to an interactive website, BWC set up a call center that features access to the company database, to quickly answer customers' requests.

Oversight of tariffs is usually done by a shareholders assembly within the country's overall regulatory framework.

The oversight and coordination of tariffs is generally done by the shareholders of the public companies in charge of service provision (most often local government representatives), in general assemblies. In countries where there is an independent economic regulator for the water sector, tariffs are either proposed to the regulator by utilities after shareholders' approval or proposed by the regulator and approved by utility shareholders. Box 6.5 offers a brief overview of the impact on tariffs of the aggregation process.

- *In **Romania,** tariffs are voted on by the IDA General Assembly representing all local governments. However, in 2016, one of the local governments opposed the tariff increase passed by the Assembly. Raja Constanta continued to charge fees according to the tariff adjustment scheme stipulated in the delegation contract. The operator's determination to stick to the contract provisions was decisive in overcoming this resistance.*
- *In **Colombia,** tariffs are set and revised on the basis of formulas established by the economic regulator (the Water Regulatory Council), which are agreed upon in PPP contracts.*

Not all aggregated utilities use uniform tariffs across their service area.

Aggregations are sometimes used to establish cross-subsidies between high-cost and low-cost service areas; in such cases, a uniform tariff across the entire service area is the norm. However, in cases where aggregations focus on cost savings or performance improvement, the aggregated utilities sometimes maintain separate tariffs based on the cost structure in each service area.

- *In **Portugal, Romania, and Brazil,** tariffs have been harmonized over entire operating areas. The same situation applies in **Indonesia** for PDAM Intan Banjar.*
- *In **Mozambique,** the tariff is different in each municipality although FIPAG is the sole entity responsible for setting tariffs.*
- *In **Indonesia,** PDAM Tirtanadi is using, for the first time, its price-setting formula to determine tariffs in other PDAMs where it operates; this price will be subject to PDAMs' agreement. This formula has been enacted by the head of the provincial government.*

BOX 6.5. Aggregations and Tariff Increases

About half of the case study utilities experienced tariff increases after aggregation. In Portugal, this increase was thoroughly anticipated as a consequence of the large investment programs planned within the aggregation framework. The utility adopted a uniform cost-reflective tariff following a principle of solidarity across the operating area. In Brazil, SISAR gradually raised its uniform tariff to achieve operational cost recovery, as reaching financial sustainability was a major target of the utility. Throughout the aggregation process, all tariff increases were approved by SISAR's member associations. In Romania, however, it was more difficult to pass tariff increases and some municipalities opposed them. To raise tariffs more easily, utilities chose to upgrade service quality through important investments, thus increasing customers' willingness to pay. They also showed a strong determination in charging fees according to the delegated contract provisions and successfully overcame municipalities' resistance. In other case studies, such as those of COPANOR, Alföldvíz, and Kiskun-Víz, the regulatory authority caps water tariffs. This prevents utilities from raising fees although they feel they would need to in order to ensure operational cost recovery and financial sustainability.

- *In **Hungary,** both Alföldvíz and Kiskun-Víz are applying different tariffs in the municipalities of their operating areas, depending on the category of customer and the metering diameter.*

Setting clear exit and entry clauses encourages joining and ensures orderly withdrawal.

Exit and entry rules set out the technical and financial conditions under which a service can join or withdraw from the aggregation; those conditions mainly refer to the value of the assets being transferred. In addition, these rules also include governance arrangements that apply to newcomers. Among the various case studies, nine had clear entry and exit rules.

- *In **Brazil,** entry conditions into SISAR changed over time. From 1996 to 2010, water associations could join on a voluntary basis. But since then, a community must sign a services concession contract (contrato de programa) as a mandatory condition for securing state investments. The selection of targeted locations follows the state planning criterion exclusively. There is no public call for proposals to be answered by communities interested in participating.*
- *In **Portugal,** in Águas do Ribatejo, there was no specific provision about entry or exit of municipalities. When the municipality Torres Novas joined two years after the setup of the aggregated utility, a specific negotiation took place but no formal rules were established. In Águas do Alentejo, the initial partnership agreement did not provide any entry rules but a recent amendment (December 22, 2015) allows entry, with approval of the Partnership Commission and if it does not result in an increase in tariffs of 5 percent or more. Regarding exit rules, the initial agreement specified that if a municipality decides to leave, it will compensate the utility with the remaining depreciation costs of infrastructure and with incurred damages, including lost profits.*

- *In **Romania,** during the aggregation reform, little emphasis was put on the definition of entry and exit rules. The exit rule boils down to the reimbursement of all amounts invested by the operator minus the depreciation costs already paid. In Raja Constanta, only one town got out of the project because of tariff policy disagreements. When leaving, the town of Borcea paid financial compensation to Raja for the investments made. In the meantime, exit clauses have been reinforced to make political decision makers more accountable for such decisions.*

Financing, Assets and Liabilities

Cost- and revenue-sharing agreements vary according to the governance form of the aggregation.

Fundamentally, the cost- and revenue-sharing approaches arrangements depend on the legal form of the aggregated entities. Whereas in the case of special-purpose vehicles and, to some extent, concessions, individual operation and investment costs can be separated, in the case of fully merged entities those are consolidated for the utility as a whole.

- *In **Portugal, Romania, Brazil, and Indonesia** (PDAM Intan Banjar), where a corporatized entity has been created that merges all of the previous operations, costs and revenues are being consolidated and decisions on budget and investments are made for the overall utility through the shareholder assembly.*
- *In **Mozambique,** costs and revenues are processed separately for each municipality, and investments are financed by external funding. This situation reflects the fact that tariffs are also set individually for each municipality.*
- *In **Colombia,** cost- and revenue-sharing agreements are set according to the provisions of the PPP concession contracts. For the Atlántico regional scheme, 10 PPP contracts have been signed with various municipalities, for different durations and services provision (water and/or wastewater, and sometimes waste collection). Each contract has its own economic balance, and costs and revenues are contract specific. However, since 2014, the Atlántico operating area has been granted the status of regional market by the Regulation Commission. This enables the private operator to set up a regional user fee and thus implement cross-subsidies between municipalities.*

Asset ownership, development, and management depend on the form of governance of the aggregation.

The case studies exhibit a diversity of asset ownership situations. In most cases, assets remained under the ownership of local jurisdictions and their operation was handed over to an intermunicipal structure or directly to the aggregated utility through some form of concession contract. Inventories were then carried out to value the infrastructure, and compensation was granted in the form of lease payments or allocation of shares. In other cases, assets are owned by provincial or state governments, or by the aggregated utility.

- *In **Hungary, Romania, and Portugal,** WSS assets remain the property of local jurisdictions and are handed over for operation to the aggregated utility under a concessions contract (in Romania, through IDA, an intermunicipal agency). In **Portugal,** municipalities received compensation in the form of allocated shares.*

- *In **Romania and Hungary (for Kiskun-Víz),** the aggregated operator pays a lease fees to the WSS asset owners; in Romania, the lease payment is set aside into an asset management fund.*
- *In **Colombia,** the La Línea case exhibits a PPP arrangement in the form of a BOT contract. As such, it encompasses the construction and the operation of water works. At the end of the contract, all assets are to be handed over to local jurisdictions.*
- *In **Brazil,** WSS assets are owned by state governments, which generally financed them, whereas offices, workshops, vehicles, and maintenance tools belong to operators. For COPANOR, investment decisions are made by the state, whereas for SISAR they are decided by shareholders of the utility.*
- *In **Indonesia,** WSS assets belong to either the provincial governments or the local government, depending on the status of the PDAMs. Investments are funded through public funds coming from provinces, municipalities, and international aid.*
- *In **Mozambique,** FIPAG is the national fund that owns urban water assets. As such, it is in charge of infrastructure development and management. It is also responsible for investment programs.*

In most case studies, liabilities are dealt with separately from the aggregation.

Liabilities for staff, suppliers, and financiers can represent transaction costs for aggregating utilities. As such, they must be covered, either during the aggregation by the aggregated utility or separately from the aggregation by the local government budget. In most case studies, the second option was favored.

- *In **Portugal, Romania, and Brazil,** the newly aggregated operator taking over services did not take on any liability from the previous operators. No debts or claims were undertaken. In Romania, in some cases, local authorities had to extinguish former debts using their own budgets before the aggregation was completed.*
- *In **Indonesia,** the situation of PDAM Tirtanadi is similar. However, it is presently responsible for all liabilities undertaken on behalf of other PDAMs during the 25-year cooperation agreement.*
- *In **Colombia,** PPP contracts did not encompass liabilities from previous operators.*
- *In **Hungary,** the Kiskun-Víz utility took on all contractual obligations from the three merging companies. These liabilities usually did not extend to more than 1.5 to 2 years after the merger. The supplier contracts that were not advantageous for Kiskun-Víz were simply not renewed after they expired. The Alföldvíz utility signed management and operating contracts with municipalities and thus did not take any liability from previous operators.*

Harmonization of Processes and Practices

Managing staff transfer is key to mitigating transaction costs.

As shown in chapter 4, labor cost is generally among the top budget items for a utility and the one where the most potential for optimization exists through aggregation. However, careful management of the process is needed to allow for the economies of scale to materialize. Among the case studies, six did not transfer any staff (PDAM Intan Banjar in

Indonesia, BWC in Romania, COPANOR and SISAR in Brazil, La Línea and La Merca in Colombia), and seven did, either all staff or just a share (PDAM Tirtanadi in Indonesia, FIPAG Northern Unit in Mozambique, Raja Constanta in Romania, Kiskun-Víz and Alföldvíz in Hungary, Águas do Alentejo and Águas do Ribatejo in Portugal).

- *In **Indonesia,** PDAM Tirtanadi took on 40 employees from PDAM Tirta Deli. These employees were subject to a selection process to determine their rank and job assignment. Staff from other local water utilities were also taken on when cooperation agreements were signed.*
- *In **Mozambique**, FIPAG Northern Unit took on all staff from previous operators and implemented a comprehensive on-the-job training program that improved employees' operational and management skills.*
- *In **Romania,** Raja Constanta took over all employees from the former operators and committed to make no redundancy during the first two to three years of operation. As a result, the number of employees increased by nearly 50 percent while salaries almost doubled.*
- *In **Hungary**, all staff from previous companies were transferred to Alföldvíz and Kiskun-Víz. The salary gap between transferred staff was gradually closed by raising lower salaries to the highest level for similar jobs.*
- *In **Portugal,** both Águas do Alentejo and Águas do Ribatejo took on a share of the staff from former operators, representing 30 percent of Águas do Alentejo staff and 50 percent for Águas do Ribatejo, and also hired additional staff.*

IT systems and administrative practices harmonization take time and can be costly.

As stated in chapter 2, the harmonization of IT systems and administrative practices can generate transaction costs that can limit or delay the materialization of aggregation benefits. Four case studies display some concrete examples of IT or administrative harmonization practices.

- *In **Hungary,** the aggregated utility of Kiskun-Víz selected the IT customer databases and invoicing systems from Halasvíz, one of the aggregating providers, for use, and data were migrated from the other aggregating companies. This created a one-off cost for 2012–2013. Customer service operations were suspended for one day for the transition. After the merger in September 2013, Kiskun-Víz issued its first invoice in November 2013. The consolidated system for the management of outstanding invoices was ready in 2015. A central customer service office was supplemented by two new local offices open three days a week, and a number of small "customer service points" are available once a week in some of the smallest settlements. The three merging companies—Halasvíz, Kalocsavíz, and Kőrösvíz—also brought different operational practices into the merged company of Kiskun-Víz. These practices were harmonized by selecting the "best practice" and introducing it in the operation of the Kiskun-Víz utility. For example, Kalocsavíz had an efficient system for the management of unpaid invoices, which was adopted throughout the aggregated utility. The frequency for meter reading was also lowered, and electronic payments have been made available for all customers, whereas cash payment is no longer possible.*

- *In **Indonesia,** PDAM Tirtanadi opened branch offices to manage customer relationships in all PDAMs with which it signed cooperation agreements.*
- *In **Romania,** the BWC operating area was reorganized around Brasov and Rupea, two main areas that have their own water systems supplying surrounding rural settlements. They became the main headquarters, where administrative and commercial functions have been consolidated; local technical centers have been set up in many rural locations for day-to-day maintenance.*
- *In **Mozambique,** when FIPAG Northern Unit took over service provision in Nampula, Nacala, and Pemba/Metuge, it nominated new executive management and introduced new working methods and new business-driven approaches.*

Notes

1. Only some of the localities served by Raja Constanta are shareholders of the company; these localities are the ones served by the utility before the aggregation process.
2. For the purpose of this particular study, accountability is defined as being answerable to other parties for policy decisions, for the use of resources, and for performance.

Chapter 7 Guidance For A Successful Aggregation

This chapter sums up the lessons learned about successful aggregations based on the evidence gathered at the international level, through the statistical analysis and the 14 case studies. It then proposes recommendations and specific guidance for a successful aggregation, shaping lessons learned into a road map and pointing out key decision points.

Lessons Learned

The list below consolidates the main lessons and observations from the report's various evidence bases, including the global data set (chapter 3), the IB-Net database (chapter 4), and the various case studies (chapters 5 and 6). Page numbers indicate the section of the report where the lesson learned is discussed in greater detail.

What Are Global Aggregation Trends?

- The level of decentralization of WSS services increases in countries with higher levels of development and overall service coverage. 20
- Aggregation is a relatively recent trend mainly observed in African, European, and Latin American countries. 21
- Aggregation is more predominant in countries where local governments are responsible for WSS service delivery. 22
- The predominant aggregation type is a top-down, mandated process, targeted toward economic efficiency, encompassing all functions and services, following administrative boundaries, and taking the form of a merger. 23
- Aggregations are happening in a diversity of contexts but are more frequent in countries with high WSS services coverage. 27
- Aggregations in countries with limited sector performance are predominantly aiming at improving services, whereas in countries where the coverage is high, economic efficiency is the main driver. 27
- Countries with smaller utilities and more fragmented water sectors pursue voluntary aggregations more frequently. 27

When Do They Work? The Quantitative Evidence

- Utilities serving several towns do not see a straightforward decrease in unit costs when their size increases. 35
- Most aggregations involve larger, urban utility companies taking over smaller, more rural towns, and therefore tend to add few customers and decrease density. 36
- Utilities going through aggregation do not see decreases in the cost of labor, a key expenditure and expected area of economies of scale. 36

- The population and number of towns covered by an aggregation vary widely depending on the initial urban versus rural context. 61
- Having a large utility as nucleus can work, but aggregation of similar-sized small utilities can also be successful. 64

Process

- Countries using aggregation as part of a broader sector reform package—for example, in the context of European accession—have usually settled on a mandated, top-down process. 66
- Financial support and/or incentives (a "Big Push") are important to help services get out of the low-level equilibrium trap. 67

Governance

- Aggregations in EU countries have tended to use long-term delegated arrangements signed with public operators, whereas aggregations in other countries have tended to use mergers. 68
- Aggregation forces more explicit decision-making processes, leading to better corporate governance. 71
- Establishing a system of checks and balances among shareholders is important. 73
- Strong citizen engagement and clear accountability mechanisms should be put in place in parallel with the aggregation. 74
- Oversight of tariffs is usually done by a shareholders assembly within the country's overall regulatory framework. 76
- Not all aggregated utilities use uniform tariffs across their service area. 76
- Setting clear exit and entry clauses encourages joining and ensures orderly withdrawal. 77
- Cost- and revenue-sharing agreements vary according to the governance form of the aggregation. 78
- Asset ownership, development, and management depend on the form of governance of the aggregation. 78
- In most case studies, liabilities are dealt with separately from the aggregation. 79
- Managing staff transfer is key to mitigating transaction costs. 79
- IT systems and administrative practices harmonization take time and can be costly. 80

Road Map to a Successful Aggregation

Figure 7.1 presents an overview of a road map toward a successful aggregation, starting with the decision about whether aggregation is the proper policy instrument given the context

FIGURE 7.1. Road Map to a Successful Aggregation

DECIDING 1-3 YEARS

- Understand the policy purpose you seek to achieve, and the context in which it takes place
- Decide whether aggregation is the right policy option to achieve your purpose
- Identify other complementary policy actions that will be necessary

DESIGNING 1-5 YEARS

- Engage with stakeholders to build ownership and defuse conflict
- Define the appropriate scope and scale to achieve the purpose intended
- Select a goverance model than will ensure success
- Discuss and reach agreement on the governance of the future aggregated provider
- Agree on the process that will most likely lead to success

IMPLEMENTING 1-10 YEARS

- Establish the appropriate legal framework for aggregation
- Involve stakeholders throughout the process
- Define the necessary incentives to align interests at various levels
- Provide the necessary technical & financial support to aggregating entities
- Manage the risks linked to the aggregation process

SUSTAINING 5-15 YEARS

- Document the process and publicize success to all stakeholders
- Learn from challenges and adjust accordingly
- Deal with longer-term harmonization issues

and purpose intended, continuing to the design of a successful aggregation process and its implementation, and finally looking at how to sustain such success. For each stage, the figure and underlying table (table 7.1) summarize the key messages emerging from this study and refer to more specific sections of the report and associated toolkit (accessible at www.worldbank.org/water/aggregationtoolkit) for further resources.

Table 7.1 also indicates the approximate timeline for each stage, based on the experience collected in the case studies. Overall, aggregations are long-term efforts rather than short-term policy fixes, taking anywhere from 3 to 20 years, although individual circumstances can affect the duration of each stage significantly.

The figure and complementary table are not meant to represent a definitive and unilateral set of principles; as stated throughout this report, understanding context and purpose, and designing and implementing with those taken into account, is key to success. Nonetheless, both represent an effort to provide, to the extent possible, the best guidance available based on this study's evidence.

TABLE 7.1. Road Map

When you need to...	Consider the following...
	DECIDING whether to conduct an aggregation *Typically 1–3 years*
Understand the policy purpose you seek to achieve and the context in which it takes place	• The main purpose(s) of the aggregation process (lowering costs, improving performance, establishing cross-subsidies, and so on) and the overall context in which you operate will influence the design and implementation of the aggregation (chapter 2). Understanding and analyzing the physical context and enabling environment is a key prerequisite to deciding whether to pursue an aggregation process and to designing it properly (chapter 4). As part of the context analysis, it is important to identify the vested interests of all stakeholders that will be affected by aggregation, so as to tackle the potential problems, conflicts, or resistance and their potential impacts on the aggregation process. These stakeholders comprise not only national and local elected officials but also staff, customers, and the general public (chapter 5).
	• Some aggregations failed because the champions did not understand who would win and lose from the process, did not build the necessary coalition with winners, and did not offer incentives to bring potential losers on board. Take the time to understand the political economy of the sector and proposed reform before deciding (chapter 5; box 5.2).
Decide whether aggregation is the right policy option to achieve your purpose	• Make sure aggregation is the right policy tool for the context or purpose. For instance, small and less complex aggregations are more likely to achieve cost savings. In contrast, economic efficiency may be hard to achieve if the utility is trapped in a low-level equilibrium (chapter 2; box 2.1). Small utilities tend to see their performance increase through aggregation; expanding utilities that already serve several towns can create cost savings. Economic efficiency is more likely to be achieved when the sector is mature and performing well (box 4.5). There might be other sector reform options more suitable to achieve the purpose sought (box 6.2). • Aggregation can take more than a decade to deliver its benefits. Do not expect quick outcomes, and allow some time for them to materialize. Set up performance-based monitoring to report on progress at timely intervals (chapter 5). • Aggregations will often involve trade-offs between service quality and cost of service; be prepared to understand and communicate those trade-offs clearly to stakeholders to build their principal support for the reform. • When coupled with support for investments, aggregation can act as a Big Push, helping utilities get out of a low-level equilibrium (characterized by low cost and low quality). However, costs (and tariffs) are likely to increase alongside service quality (chapters 4, 6, box 5.3, box 6.5).
Identify other complementary policy actions that will be necessary	• Conducting successful aggregation requires the proper policy and legal instruments to be in place, in particular with regard to the regulatory framework or the corporate governance of utility companies. In some countries, legal barriers with regard to responsibility for and delegation of service provision, competition rules, or public asset transfers might need to be addressed before the aggregation is launched (chapter 6, box 6.4).

table continues next page

When you need to...	Consider the following...
DESIGNING a successful aggregation *Typically 1–5 years*	
Engage with stakeholders to build ownership and defuse conflict	• Ensure that the design is widely consulted and validated with politicians, local officials, and utility managers to ensure all interests are taken into account during the design of aggregation. Also implement communication and engagement campaigns with unions, media, customers, and civil society to gain cooperation and acceptance from those parties (chapter 5, box 5.2).
Define the appropriate scope and scale to achieve the purpose intended	• Small utility providers aggregating together are more likely to achieve performance improvements (chapters 3, 4, and 6); however, costs might not decrease as economies of scale are "reinvested" into better services. • Include a large utility in the aggregation to act as a nucleus only if this is necessary to achieve your purpose; look at alternative models to achieve the same purpose while grouping primarily providers of the same size (chapter 6, box 6.2). • Cost savings are easier to reach for small and less complex aggregations (chapter 4). • Be mindful of the risk of cherry-picking, which could undermine the achievement of the aggregation's purpose if strong externalities are involved and providers are left with loopholes to opt in and out on the basis of their individual interests (chapter 5, box 5.4). • Whereas most aggregations involve all functions and follow administrative boundaries, there are successful examples of more narrow aggregations of either scope (chapter 6, box 6.3, box 6.2) or scale (chapter 6, box 6.1)—so be open and explore options.
Select a governance model that will ensure success	• Take the opportunity of the aggregation to adopt strong corporate governance practices to ensure financial and managerial autonomy as well as business-oriented practices, while maintaining clear accountability to shareholders (chapter 6). • Set clear rules of the games to address routine decision making as well as the unexpected: entry and exit rules, asset transfer, voting rights and power distribution, cost and revenue sharing, investment decisions, and so on (chapter 6). • Compensate for loss of accountability by embedding mechanisms in the utility routine to reduce distance from customers (give customers the possibility to complain, improve responsiveness through website and upgrading of IT systems) (chapter 6). • Design a balanced governance arrangement in which consensus reaching is embedded, to overcome local authorities' fear of loss of control; this can be done through a balanced allocation of voting rights (equal allocation, or according to population served, to volume sold, to asset ownership) (chapter 6). • Choose the legal form adapted to your purpose, scale, and scope (chapter 3, box 6.3): pure economic efficiency might be best achieved through special-purpose vehicles focused on a narrow scope, whereas a broad cross-subsidy scheme might be better served by a full merger solution in which costs and revenues are not separated across service areas. • Aggregation must be designed as a long-term process and as such should not rely on specific circumstances that might change over time (enlightened mayor, specific crisis, and so on) (chapter 5).
Agree on the process that will most likely lead to success	• Design the process of aggregation in accordance with the purpose targeted: externalities are easier to reach through incentivized or financially supported processes whereas internalities may be reached through voluntary (or incentivized) processes (chapters 2, 3, and 6). • When designing aggregation, leave space for local flexibility and ownership, following a principle of subsidiarity. This will help gain support from local stakeholders and ensure that the final design is the most appropriate to ensure the success of the aggregation (chapter 5). • Be aware of key elements that generate transaction costs, such as staff transfer, liabilities, and consolidation of IT systems, and seek to mitigate them by planning ahead (chapters 2 and 5).

table continues next page

When you need to...	Consider the following...
	IMPLEMENTING a successful aggregation *Typically 1–10 years if the aggregation is gradual*
Establish the appropriate legal framework for the aggregation	• A proper legal framework must be in place before the aggregation process can be implemented. Given the time that some legislative changes might require, plan and deploy the corresponding laws and bylaws ahead of time (chapters 5 and 6).
Involve stakeholders throughout the process	• Build consensus among stakeholders through early consultation (chapter 5). • Identify a few champions who will help move the process forward at the various levels (chapter 5). • Be clear about expected outcome and trade-offs, and communicate on progress achieved, as in many cases, costs and tariffs are likely to go up along with service quality (chapter 5). • Strengthen the working relationship between local authorities and utility executive management through regular meetings, monitored performance, and objective indicators, and the like (chapter 5).
Define the necessary incentives to align interests at various levels	• Align interests at all levels in a sustainable and reliable manner using financial, legal, or other incentives, for instance, to compensate the perceived loss of control of certain stakeholders and ensure the interests of various stakeholders are broadly aligned behind the aggregation's purpose (chapters 5 and 6). • Externalities are easier to reach when financial support is provided to aggregating utilities, as it helps them fund investment projects (chapter 6). • When financial support is provided by external partners, consider linking the allocation of external funds to the implementation of aggregation through eligibility criteria, as it is an effective tool to boost aggregation (chapter 6).
Provide the necessary technical and financial support to aggregating entities	• Provide financial and technical support, especially to small utilities, to implement aggregation and address transaction costs, both one-off and long-term ones (chapter 5). • Provision of technical assistance by the government or donors can be effective to help local stakeholders tailor an aggregation to their conditions and needs (chapter 5). • Investment (co-)financing (EU, state) is an important incentive, but it can have perverse consequences such as rushing reforms to meet tight deadlines to spend aid, encouraging white elephants or suboptimal solutions, or degrading cost recovery levels. Be mindful not to create perverse incentives when designing them (chapter 5).
Manage the risks linked to the aggregation process	• Mitigate cherry-picking practices by encouraging principle of solidarity and establishing stringent criteria for entry and exit (box 5.4). • Anticipate and lower transaction costs as much as possible (IT systems merger and management, staff transfer and wages harmonization policies) (chapter 5). • Set up harmonization processes to ensure that service management improves its capacity, through best practices review and implementation across aggregating services (chapter 6).
	SUSTAINING success *Typically 5–15 years*
Document the process and publicize success to all stakeholders	• Show and document success to build and keep stakeholder commitment through performance-based monitoring, accountability mechanisms, and the like (chapter 5).
Learn from challenges and adjust accordingly	• Adjust the framework through a gradual improvement strategy, after reviewing monitored achievements against purposes (chapter 5). • Consider that most aggregations are not one-off processes and that the results of the initial phase should inform continued consolidation of the sector.
Deal with longer-term harmonization issues	• Deal with aftermath issues and transaction costs: excess staff, harmonization of working practices, consolidation of IT systems, reorganization of the utility chart, and so on (chapters 2 and 5). • Some of the harmonization challenges can be costly and time-consuming to solve, so plan time and financial resources accordingly, not just during the aggregation but also in the years thereafter (chapter 6).

Chapter 8 Conclusions

At the start of the study, the team set out to provide concrete, evidence-based policy guidance on when, why, and how the aggregation of water and sanitation utilities can successfully deliver specific policy outcomes. Perhaps not unexpectedly, the evidence base is not always as conclusive and clear-cut as a policy maker would want. Some of the conclusions might appear counterintuitive or contradict conventional wisdom. The authors consider that this, in itself, is an important finding as it underlines the importance, for policy makers and practitioners, of pausing and thinking about reforms before replicating a model that might have appeared successful in a different context, for a different purpose. That being said, a few broad conclusions can be derived from the overall effort, in addition to the more detailed guidance provided in the previous chapters.

1. **Aggregation is a policy option, not a panacea for all sector challenges.** A growing number of national and local governments are turning to aggregation to face the double challenge of increasing demand for better services and limited fiscal space. In many cases, those aggregations have delivered positive outcomes but not always those expected initially. In some cases, the process has stalled or failed because it was not the right policy action or because it was poorly designed. One-off and long-term transaction costs have prevented expected economies of scales from materializing at the scale expected.
2. **Aggregations come in many different shapes and forms, depending on the local circumstances.** The scope, scale, process, and governance of aggregation processes varies greatly between regions and countries, and even within countries. Whereas some utilities chose to associate with neighboring ones only for specific functions such as the purchase of chemicals, others fully merge their operation at the regional level or set up a separate company to manage shared assets such as a large-scale water treatment plant. That diversity of cases reflects the diversity of local circumstances, and governments developing aggregation reforms would do well to leave space for those to be taken into account in the final design of an aggregation.
3. **The design of a successful aggregation will depend on the intended purpose of the aggregation, as well as on the overall context in which it takes place.** For practitioners and policy makers considering an aggregation process, the report recommends considering first what policy outcome is being sought—better services? lower costs? solidarity between urban and rural areas? environmental benefits?—as well as the overall context—political economy, performance and size of utilities, and so on—before designing the aggregation's scope, scale, governance, and process, taking into consideration the guidance provided in the previous chapters. Most of the cases of failure are linked to designs that responded poorly to the combination of purpose and context in which the aggregation was taking place.

4. **In the developing world, aggregation is primarily a means to deliver better services rather than to lower costs.** Many practitioners associate aggregations with the concept of economies of scale and expect to see cost reductions. However, in many cases, the preaggregation costs of services are below those necessary to provide a reasonable quality of service (at a low-level equilibrium). In fact, this work shows that most often, in particular in the developing world, aggregations involve larger municipal companies taking over smaller, underperforming ones nearby, often with significant infrastructure investments, with an aim to improve the coverage and quality of services—in effect taking such utilities out of their low-level equilibrium. In such cases, costs increase alongside service quality, a necessary but not always expected outcome of the aggregation.
5. **Aggregation is a gradual, long-term process that requires strong stakeholder commitment.** Aggregations take time to design and even more time to implement and sustain. Among the study's 14 concrete cases, only 2 took fewer than 5 years in total, with some needing as many as 20 years to fully consolidate their effect. Aggregations shift the balance of power among stakeholders significantly and therefore require time to build support and consensus in the first place. In addition, utilities that aggregate often do so in successive phases rather than in a single step, as success breeds success. Finally, many aggregated utilities find that dealing with harmonization issues, whether human resources, IT systems, or administrative processes, is best pushed to after the merger and addressed gradually once the dust settles and the commitment to an aggregated provider grows.
6. **Finally, aggregations are most successful when accompanied by a broader sector reform addressing governance, financing, and regulatory issues at the sector level.** Many countries accompany the aggregation process with a solid sector reform package ranging from clarifying arrangements for corporate governance, to establishing a solid regulatory framework and a financing program that not only provides incentives for aggregation, but also helps achieve some of the performance gains that are often desired from the process (embodying the concept of the "Big Push").

This study does not pretend to provide a definitive answer to the question of when, why, and how aggregation can successfully deliver specific policy outcomes. Aggregation is a relatively recent phenomenon, and longer time series would be necessary to understand the long-term impact of aggregation. Similarly, the data sets do not allow a complete understanding of the transaction costs that emerge during aggregations, how they evolve over time, and how best to mitigate them. Aggregations are conducted for a wide variety of purposes, and the available data primarily allow an understanding of effectiveness only with regard to cost savings and performance improvements. And of course, the case studies demonstrate time and again the importance of a favorable political economy and overall country environment for the success of the process, but more work is necessary in that regard.

Nevertheless, the authors hope that this study has shed some light on the complexities and trade-offs associated with designing and implementing aggregation reforms, while providing relevant guidance on how to make such reforms as successful as possible. With that, the hope is that this work enables policy makers and practitioners who are considering aggregation to better understand whether it is a relevant policy option for them, and to use the analysis and case studies to make more informed decisions about the design and implementation of the process.

Appendix A Case Study Summary Tables

TABLE A.1. Overview of Case Studies Context and Purpose

CASE STUDY	CONTEXT				PURPOSES
	GDP/ capita ($)	Performance	Density	Towns before / after	
COPANOR Minas Gerais, Brazil	8,677.8	Low	Rural	– / 239	Professionalization, performance, economic efficiency
SISAR Ceará, Brazil	8677.8	No service provision	Rural	– / 153	Access to water provision, performance, solidarity, economic efficiency
Mercado Regional del Atlántico, Colombia	60,56.1	Low	Urban and rural	– / 15	Performance, professionalization, economic efficiency
Regional La Línea, Colombia	60,56.1	Low	Urban and rural	4 / 4	Performance, professionalization, economic efficiency
Alföldvíz, Hungary	12,365.6	High	Urban and rural	66 / 131	Economic efficiency, performance, professionalization
Kiskun-Víz, Hungary	12,365.6	High	Urban and rural	– / 54	Economic efficiency, performance, professionalization
PDAM Intan Banjar, Indonesia	3,346.5	Low	Urban	1 / 2	Performance, professionalization
PDAM Tirtanadi, Indonesia	3,346.5	Low	Urban	1 / 7	Performance, professionalization, economic efficiency
Chimoio/Gondola/Manica, Mozambique	529.2	Low	Urban	1 / 3	Performance, professionalization, economic efficiency
Nampula, Nacala and Pemba/ Metuge, Mozambique	529.2	Low	Urban	2 / 3	Performance, professionalization, solidarity, economic efficiency
Águas Públicas do Alentejo, Portugal	19,222.9	Medium	Urban and rural	– / 20	Performance, professionalization, environmental benefits, solidarity (cross-subsidies among municipalities)
Águas do Ribatejo, Portugal	19,222.9	Medium	Urban and rural	– / 7	Performance, professionalization, environmental benefits
Brasov, Romania	8,980.7	Medium	Urban and rural	9 / 15	Environmental benefits (EU driven), performance, professionalization, economic efficiency
Raja Constanta, Romania	8,980.7	Medium	Urban and rural	57 / 152	Environmental benefits (EU driven), performance, professionalization, economic efficiency

TABLE A.2. Overview of Case Studies Design and Findings

Case study	Scale	Scope	Process	Governance	Outcome	Main findings
COPANOR Minas Gerais, Brazil	Watershed limits	WSS functions and services	Voluntary and Incentivized	Merger; public company; tariff harmonized; no staff transfer	Positive but financial sustainability for operation yet	"Itinerant" staff contribute to higher cost as not suited for the scale and dispersion of rural settlements, cooperation agreements with local associations strengthen customer relationships
SISAR Ceará, Brazil	Watershed limits	Water service and functions	Voluntary and Incentivized	Special-purpose vehicle; private association; tariff harmonized; no staff transfer	Positive with financial sustainability for operation	Successful model of aggregated utility to provide service in rural areas which has been duplicated in other parts of the country, close relationship between communities and their water associations, community-based labor force hired part-time, performance-based monitoring

table continues next page

TABLE A.2. continued

Case study	Scale	Scope	Process	Governance	Outcome	Main findings
Mercado Regional del Atlántico, Colombia	Administrative boundaries	WSS functions and services, Waste collection	Voluntary and Incentivized	Delegated; public-private partnership; asset transfer; no staff transfer	Positive including lower marginal costs	Strong cooperation between municipalities and operator made easier by clear aggregation institutional arrangement (ownership, duties), good reputation and achievements of operator contributed to acceptance from population with new municipalities joining, accountability efforts (awareness campaigns, meetings w/social leaders, creation of social control committees), champion utility an governance leader
Regional La Línea, Colombia	Administrative boundaries	WSS functions and services	Voluntary and Incentivized	Delegated; public-private partnership; tariff harmonized; asset transfer; no staff transfer	Negative	Political opportunistic behaviors, lack of long-term financial support, lack of utility champion and governance leader, blurred definition of asset ownership and associated duties, set targets to be reached gradually (allow some time for improvement)
PDAM Intan Banjar, Indonesia	Administrative boundaries	Water service and functions	Voluntary and Incentivized	Merger; public company; asset transfer; all staff transferred	Increased performance and costs	Creation of a new local jurisdiction within the perimeter of the existing water utility, water system already interconnected, structure of utility did not change after aggregation
PDAM Tirtanadi, Indonesia	Administrative boundaries	WSS services and functions	Voluntary and Incentivized	Delegated; public company; tariff harmonized; asset transfer; all staff transferred	Increased performance and costs	Technical and management skills from PDAM Tirtanadi to be transferred to other PDAMs through cooperation, limited staff transfer (40 employees), reached cost recovery in 2013 but further tariff increases needed to fund investment needs and maintain financial sustainability
Alföldvíz, Hungary	Administrative boundaries	WSS functions and services	Mandated	Merger; public company; tariff harmonized; asset transfer; no staff transfer	Positive with decreased water OPEX but increased wastewater OPEX (due to network expansion)	Creation of a "merger project team" dedicated to the expansion of service area ensuring relationships with future member municipalities, many municipalities insist on using their own water resources which are costly instead of using water from the integrated system, aggregation appears beneficial especially for service quality and sustainability in small municipalities
Kiskun-Víz, Hungary	Administrative boundaries	WSS functions and services	Mandated	Delegated; public company; staff partially transferred	Positive with slight decrease in OPEX	Political resistance when choosing utility headquarter location and nomination of chief executive officers, difficult to retain skilled staff due to financial constraints, accountability mechanisms toward employees, harmonization of operational practices among aggregated entities based on best practice, accountability toward customers (satisfaction survey), aggregation appears beneficial especially for service quality and sustainability in small municipalities

table continues next page

TABLE A.2. continued

Case study	Scale	Scope	Process	Governance	Outcome	Main findings
Chimoio / Gondola / Manica, Mozambique	Administrative boundaries	Water service and functions	Voluntary and Incentivized	Merger; public administration; asset transfer; all staff transferred	Negative as very little improvement	Investment projects supported by external funding, technical assistance provided by donors, performance-based monitoring, limited improvement
Nampula, Nacala and Pemba / Metuge, Mozambique	Administrative boundaries	Water service and functions	Voluntary	Merger; public administration; asset transfer; all staff transferred	Negative as very little improvement	Investment delayed due to political arbitration hence services trapped in low-level equilibrium, performance-based monitoring, technical and capacity assistance, aggregation has not delivered yet clear benefits
Águas Públicas do Alentejo, Portugal	Administrative boundaries	Water production and transport, Wastewater treatment	Voluntary and Incentivized (EU funds)	Delegated; public company; tariff harmonized; asset transfer; staff partially transferred	Positive, but with OPEX increase	Resistance of municipalities was overcome by partnership agreement showing a balance between state and municipalities (need to search for consensus), necessary alignment of municipalities interests, staff transfer (30%), bulk price harmonized but retail prices vary in each municipality
Águas do Ribatejo, Portugal	Administrative boundaries	WSS functions and services	Voluntary and Incentivized (EU funds)	Delegated; public company; tariff harmonized; asset transfer; staff partially transferred	Positive, but with OPEX increase	Staff transfer (50 percent), doubts and tensions overcome after two municipalities withdrew permanent political support after implementation, time used to design institutional arrangement is factor of success, higher tariffs, environmental protection arising from sanitation improvement
Brasov, Romania	Administrative boundaries Cautious and gradual expansion	WSS functions and services	Mandated and supported financially (EU funds)	Delegated; public company; tariff harmonized; asset transfer; staff partially transferred	Positive except OPEX going up in some parts of the operating area	Political resistance (fear of losing control), accountability efforts through direct link with customers (information program on investment projects in schools—reaching the children to reach the parents, call center, possibility to file complaints, interactive website, smartphone app), gradual and cautious expansion of service area, EU funds as a Big Push to get out of low-level equilibrium
Raja Constanta, Romania	Administrative boundaries Proactive expansion	WSS functions and services	Mandated and supported financially (EU funds)	Delegated; public company; tariff harmonized; asset transfer; all staff transferred	Positive but OPEX going up	Stability of operator management staff (since 2003) gives credibility and leadership, political support of IDA members to adopt tariff increase to ensure sufficient financial resources, political resistance was overcome (municipality left) but lack of engagement, staff transfer (100 percent), EU funds as a Big Push to get out of low-level equilibrium, proactive expansion of service area

Appendix B Statistical Analysis Methodology

Overview

Much of the literature relied heavily on cross-sectional comparisons of utility structure and its connection to performance. For example, do systems with high volumes exhibit lower unit cost than systems with low volumes? When considering an aggregation reform, the relevant policy question is, however, whether the utility improved when compared with the situation if it did not aggregate. The IB-Net data has shown that aggregations often add little volume and tend to decrease density; hence, a comparison of low- and high-volume utilities could be very misleading.

In the statistical analysis, utility performance was monitored before and after consolidations for aggregating utilities and compared with non-aggregating utilities. To this end, regressions including utility-fixed effects are run to compare the performance change of consolidating firms with non-consolidating firms. As the data show, aggregating utilities differ from the average utility in IB-Net, suggesting that the choice of the control group—for example, the utilities without aggregation that are used as a comparison—might be important for the results obtained. With the overall goal of a counter-factual scenario—of what the average cost of a utility would be in the absence of a consolidation—not all utilities are suitable for comparison.

For this reason, different matching techniques were used to select suitable comparison utilities. In each case, a large set of pretreatment characteristics—to estimate the probability that a utility experiences a consolidation—was used to identify the final sample. Depending on the matching algorithm, one or several utilities with similar treatment probability were then chosen as the control group. While the combined analysis of water and wastewater was continued (volume is the sum of water produced and wastewater collected), for the choice of comparison units the separate indicators are used. Hence, the variables to estimate the probability of an aggregation include important utility characteristics such as the population in the service area and the number of towns served, separately for water and wastewater. The pretreatment performance of a utility with regard to managerial and operating efficiency (WUPI) is also added. Finally, dummies for country as well as year enter the specification to capture heterogeneity across countries and time. The former is particularly relevant, as some countries do not experience any aggregations while others experience a considerable number.

Apart from the statistical necessity of balancing utility characteristics between treatment and control groups, this approach also ensures that the consolidation effects are evaluated in comparison with utilities of similar initial size and that utilities exhibit similar shares of water and wastewater services. As the empirical literature has stressed decreasing economies of scale and even diseconomies of scale, it seems imperative to match utilities according to their production structure in size and scope. The production characteristics were first added linearly, before adding squared terms where necessary to achieve balancing.

As the choice of the matching algorithm is somewhat arbitrary, three matching approaches were used and also the complete sample of utilities, which boils down to using four control groups: (i) nearest-neighbor propensity score matching, (ii) four-nearest-neighbor propensity score matching, (iii) radius matching, and (iv) all utilities in the sample. The different algorithms (i) to (iii) represent choices in the trade-off between bias and variance. All three algorithms were limited to the utilities on common support. The complete sample, (iv), is displayed for comparison reasons but should be interpreted with care as the compared utilities differ substantially.

These subsamples of comparable treatment and control utilities are then used in the generalized difference-in-difference specification, where the performance indicators are regressed on the aggregation indicator, which is 1 in years following an aggregation and zero otherwise.

In addition to variable cost per cubic meter (in natural logs of dollar converted local currency), indicators for coverage, service quality, and managerial efficiency as well as the composite performance indicator WUPI were distinguished. Looking at various performance indicators is necessary because aggregations can follow various purposes, and achieving scale economies may not be a goal at all. The regressions include utility and time-fixed effects, which means that the effect of an aggregation is identified by comparing unit costs over time and between treated and control utilities.

It should be noted that the use of variable cost gives the estimates a short-term interpretation. Capital stock with regard to the network infrastructure is certainly fixed, making a modification infeasible or prohibitively costly. The durability of water pipes is typically very long term—up to 50 years, depending on the situation and the material—which would indicate that the system configuration is fixed for a very long time horizon. Although a comprehensive analysis of short- and long-run costs would still be desirable, this was not feasible with the data at hand.

Given the discussions in the previous sections, the effect of aggregations might depend both on the initial structure of the utility and on how the aggregation changes a utility's structure. To allow for the possibility that the effect of the aggregations is not independent of the size of the change, the above model was re-run with the indicator variable replaced by dummy variables distinguishing small aggregations (less than 20 percent more towns), medium aggregations (between 20 percent and 100 percent change in the number of towns), and large aggregations (more than 100 percent change in the number of towns).

Similar specifications were run for small (less than −5 percent), medium (between −5 percent and 5 percent), and large changes (greater than 5 percent) in density and volume. Moreover, to make the aggregation effect conditional on the initial structure of the utility, the simple treatment dummy was replaced by adding dummy variables distinguishing utilities with few towns (2 towns), utilities with an intermediate number of towns (between 4 and 14), and utilities with many towns (more than 14). Again, the same if repeated with dummies indicating utilities of small, medium, and large density and volume.

TABLE B.1. Definition of the Water Utility Performance Index

N°		Indicators	Water indicators	Wastewater indicators	Unit	Higher bound	Lower bound
I1	Coverage	Water coverage	X		%	100%	0%
I2		Sewerage coverage		X	%	100%	0%
I3		Wastewater treatment coverage		X	%	100%	0%
I4	Quality of service	Continuity of service	X		hours/day	24 hours	0 hour
I5		Sewerage blockages		X	#/km	0.1	20
I6	Management efficiency	Metering	X		%	100%	0%
I7		Nonrevenue water	X		m^3/km/day	3	80
I8		Staffing level	X	X	#/1,000 water and wastewater population served	1	5
I9		Collection ratio	X	X	%	100%	0%
I10		Operating cost coverage	X	X	%	180%	50%

Source: World Bank 2015.

In all specifications, standard errors are clustered at the utility level and robustified for heteroscedasticity.

A Note on the Calculation of the Water Utility Performance Index

The Water Utility Performance Index (WUPI) used to measure the overall performance of a utility (in terms of coverage, service quality, and efficiency) is built from a set of 10 standard key performance indicators. For utilities providing only water or only wastewater services, only the relevant subindicators are used. The indicators are best practice indicators, with higher values indicating better performance. By construction, the indicators range from 0 to 100, with 0 for the lower bound values, 100 for the higher bound values, and a linear interpolation in between. The three outcome indicators are then the average value of the subindicators (table III.1).

In addition, the overall WUPI is used as an aggregate performance measure. This index is constructed as the unweighted average of all 10 key performance indicators in table B.1. As discussed in the State of Sector Report (World Bank 2015), the index is not only consistent with other aggregate performance indicators such as IB-Net's APGAR score but also robust to missing values.

References

Abbot, M., and B. Cohen. 2009. "Productivity and Efficiency in the Water Industry." *Utilities Policy* 17 (3-4): 233-244.

Canback, D. 2003. "Diseconomies of Scale in Large Corporations." Technical description, Canback Dangel Predictive Analytics Advisors, Somerville, MA.

Carvalho, P., Cunha Marques, R., and S. Berg. 2012. "A Meta-Regression Analysis of Benchmarking Studies on Water Utilities Market Structure." *Utilities Policy* 21: 40-49.

Coase, R. H. 1993. *The Nature of the Firm: Origins, Evolution, and Development*. Oxford, U.K.: Oxford University Press.

Dahlman, C. J. 1979. "The Problem of Externality." *Journal of Law and Economics* 22 (1): 141-62.

De Witte, C., and E. Dijkgraaf. 2010. "Mean and Bold? On Separating Merger Economies from Structural Efficiency Gains in the Drinking Water Sector." *Journal of the Operational Research Society* 61 (2): 222-234.

Diaz, C., and B. Flores. 2015. "Quick & Dirty Analysis: The Case for Aggregation: Water Supply and Sanitation Utilities." World Bank, Washington, DC.

ERSAR (Entidade Reguladora dos Serviços de Aguas e Resíduos). 2016. *Relatorio Anual dos Serviços da Agua e Residuos em Portugal*. Lisbon: ERSAR.

Ferro, G., Lentini, E. J., and A. C. Mercardier. 2011. "Economies of Scale in the Water Sector: a Survey of the Empirical Literature." *Journal of Water, Sanitation, and Hygiene for Development* 1 (3): 179-193.

Franceys, R., and E. Gerlach. 2008. Regulating Water and Sanitation for the Poor - Economic Regulation for Public and Private Partnerships. London: Earthscan.

Fraquelli, G., and Giandrone, R. 2003. "Reforming the wastewater treatment sector in Italy: Implications of plant size, -structure, and scale economies." Water Resources Research 39.

Fraquelli, G., and V. Moiso. 2005. "Cost Efficiency and Economies of Scale in the Italian Water Industry." Paper presented at the XVII Conferenza Società Italiana di Economia Pubblica, Dipartamento di Economia Pubblica e Territoriale, Università di Pavia, Pavia, Italy, September 15-16.

González-Gómez, F., and M. A. Garcia-Rubio. 2008. "Efficiency in the Management of Urban Water Services. What Have We Learned After Four Decades of Research." *Hacienda Pública Española/Revista de Economía Pública* 185 (2): 39-67.

Klien, M., and D. Michaud. 2016. "Utility Consolidations: Review of Existing Evidence and Lessons from Central and Eastern Europe." World Bank, Washington, DC.

Mizutani, F., and T. Urakami. 2001. "Identifying Network Density and Scale Economies for Japanese Water Supply Organizations." *Regional Science* 80 (2): 211-30.

Saal D., Arocena P., Maziotis, A., and T. Triebs. 2013. "Scale and Scope Economies and the Efficient Vertical and Horizontal Configuration of the Water Industry: A Survey of the Literature. " *Review of Network Economics, De Gruyter* 12 (1): 93-129.

Saal, D., D. Parker, and T. Weyman-Jones. 2007. "Determining the contribution of technical change, efficiency change and scale change to productivity growth in the privatized English and Welsh water and sewerage industry: 1985-2000." *Journal of Productivity Analysis* (28).

Triple A. 2015. "Database: Evolución Indicadores Municipios 2015." Triple A, Barranquilla, Colombia.

Urakami, T., and D. Parker. 2011. "The Effects of Consolidation amongst Japanese Water Utilities: A Hedonic Cost Function Analysis." Urban Studies 48 (13).

Van den Berg, C., and A. Danilenko. 2015. "Regional Study on the Performance of Water and Wastewater Utilities in Africa." Draft version. World Bank, Washington, DC.

Van Ginneken, M., and W. Kingdom. 2008. "Key Topics in Public Water Utility Reform." Water Working Note 17, World Bank, Washington, DC.

Walter, M., Cullmann, A., von Hirschhausen, C., Wand, R., and M. Zschille. 2009. “Quo Vadis Efficiency Analysis of Water Distribution? A Comparative Literature Review.” *Utilities Policy* 17(3):225-232.

Water Regulatory Council (Conselho de Regulaçao do Abastecimento de Água). 2007. Annual Report.

Williamson, O. 1975. *Markets and Hierarchies*. New York: Free Press.

World Bank 2003. *World Development Report: Making Services for Poor People.* Washington, DC: World Bank.

——. 2005. “Models of Aggregation for Water and Sanitation Provision.” Water Supply and Sanitation Working Note 1, World Bank, Washington, DC.

——. 2006. “Characteristics of Well-Performing Public Water Utilities.” Water Supply and Sanitation Working Notes, World Bank, Washington, DC.

——. 2015. *Water and Wastewater Services in the Danube Region. A State of the sector.* Washington, DC: World Bank.

WORLD BANK GROUP

SKU W17033